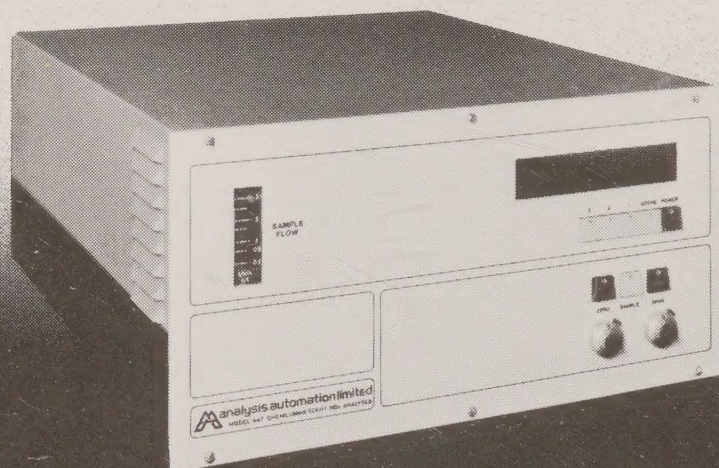


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NATIONAL SOCIETY FOR CLEAN AIR

VOL.18 NO.1
SPRING 1988

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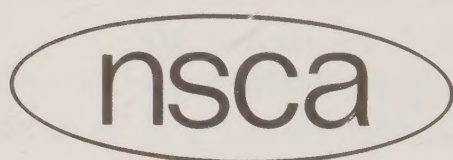


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EDITORIAL

BEST PRACTICABLE ENVIRONMENTAL ORGANISATION?

The publication of the RCEP's 12th Report, 'Best Practicable Environmental Option' is a timely reminder of the UK's fragmented approach to pollution control. Certainly the return of Her Majesty's Inspectorate of Pollution to the DoE, long urged by this Society, is the first vital step in this direction. RCEP comment "... we regard the Inspectorate as an essential prerequisite for the application of a multi-media approach to pollution control". Yet we have a long way to go before HMIP can act with equal authority in relation to the land, water, air and noise pollution sectors.

There is a message here for the activities of NSCA. If pollution control is incoherent, so too is the response of those organisations who shadow the legislators and enforcers. Clean Air issues are complex, and often have implications for other environmental media – the introduction of flue gas desulphurisation is a case in point. Yet there is no equivalent National Society for Clean Water, or Land to fight their respective corners. NSCA is unique in its ability to bring together the top minds in the air pollution sector; to what extent should it widen its interests to accommodate the BPEO approach?

At a recent meeting the NSCA Council decided to look again at the question of the Society's future role, and whether this should be reflected in a change of name. Readers will recall that in 1981 the NSCA memorandum of association was amended to broaden the scope of Society activities "... having regard for the implications for other aspects of the environment". A working party will now be formed to see if the time has come for another tentative step forward.

This edition of Clean Air should have been the second produced by the Society's Editor, Penny Gilbert. Sadly, we have to report that Penny died on March 30th, having become seriously ill at Christmas. Penny asked us to thank the many members of the Society who wrote to her during the last three months; a full appreciation will be published in the next edition of Clean Air.

NSCA RESEARCH GRANTS

At its meeting last December, Council agreed that the Society's funds had just about reached the point where a small but worthwhile sum could be set aside to promote research in line with the Society's objectives. Paragraph 3 of the Memorandum of Association requires the Society "to initiate, assist, promote and encourage the investigation, consideration and discussion of all forms of pollution in order to achieve its reduction or prevention, and to undertake, or support or aid the undertaking of, investigations and research relevant to the causes and effects of pollution and the means to prevent it and to publish the results of such research". It was agreed to set aside the sum of £5000 for disbursement during the period ending 31 March 1989. Council also tasked the Conference and Promotions and Finance and Administration Committees to establish the rules and procedures under which the grants should be awarded. Their recommendations were approved on 10 March 1988 as follows.

Initially applications would be accepted only from University and Polytechnic Departments able to control and administer the grant although applications from the Society's Divisions would also be considered: in the latter case grants would be administered by headquarters and subject to audit in the usual way. Applications should be made to the Secretary General and should provide a brief outline of the purpose of the research, a budget (indicating funds from other sources) and a schedule showing the stages in the programme of work and deadline for completion. An end product of benefit to the Society should also be specified; for example, a report or article suitable for publication in *Clean Air* or for presentation as a paper to a Conference or Workshop. The application should also specify the organisation to which any grant should be made payable.

Grants will normally be awarded twice a year. Applications should ideally be submitted by the end of May, or November, in any year.

Finally, it was agreed to establish a Panel to consider all applications consisting of at least three members of Council under the Chairmanship of the Chairman of Council. Final decisions on behalf of Council would be made by the Steering Group in the usual way.

John Langston

REPORTS

DIOXINS

Sources, Combustion Theories and Effects

By Derrick Oakland

London Scientific Services

This paper was presented to the National Society for Clean Air at the 54th Annual Conference, Brighton, UK, October, 1987

INTRODUCTION

Polychlorinated dibenzo-p-dioxins (PCDD) and the closely related polychlorinated dibenzo furans (PCDF) constitute a group of chemicals that have been demonstrated to occur ubiquitously in the environment; they do not occur naturally and appear to have no commercial application.

The whole dioxin issue is extremely complex and very controversial. Recognised experts in their own particular fields disagree about their possible environmental sources, their mechanisms of synthesis, the short- and long-term health risks, and even on the technologies to control their presence in the environment.

The general public is aware of the association of dioxins with the Seveso explosion in Italy in 1976; of complaints arising from veterans involved in the herbicide spraying programme during the Vietnam war and, more recently, of the question mark set against emissions from municipal waste incinerators — a feature highlighted again in a recent television programme.

The word 'dioxin' is associated with some kind of virulent disease, causing malformation or deaths of animals grazing in the vicinity of incinerators, and is often quoted as being 'the most toxic material known to man'.

Whatever factual information is available — and there is a considerable amount of this — appears essentially in the technical press, mainly foreign publications, and so the general public is deprived of some of the arguments being proposed by experts each with their own theories about the environmental significance of dioxins and the closely related class of compounds, the dibenzo furans.

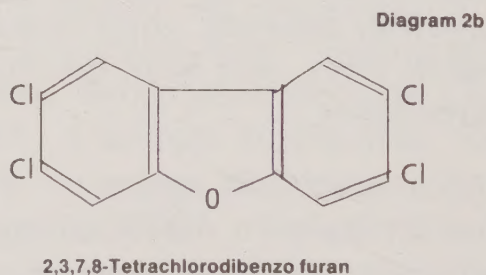
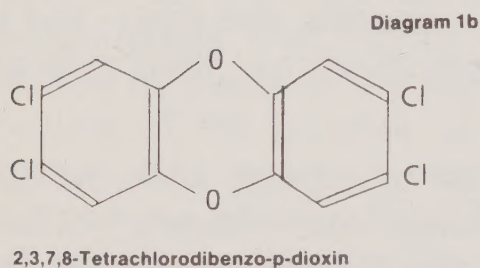
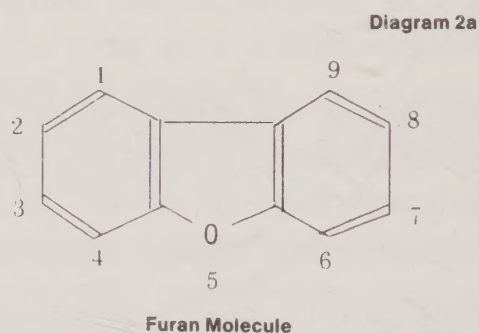
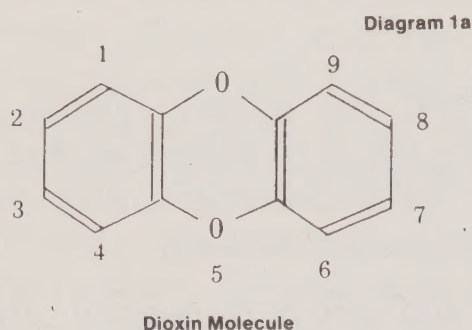
It is not intended that this paper should provide a comprehensive account of

the dioxin issue but will simply concentrate on some of those aspects that have received little attention in the media:

- Where do dioxins come from and how are they formed?
- What health risks have been identified?
- How can their presence in the environment be controlled?

CHEMISTRY OF DIOXINS AND FURANS

From Diagrams 1 and 2 it can be seen that the dioxins are structurally very similar, differing only from one another in the number and spatial arrangement of the chlorine atoms in the basic parent molecule. The two examples shown are the tetra chlorinated isomers (in the 2, 3, 7, 8 positions) and these are thought to be the most toxic isomers.



Because of the symmetrical differences between the two structures, there are 75 dioxin and 135 furan isomers.

SOURCES

It is recognised that dioxins arise in the environment from three general sources:

- as trace contaminants in commercial products;
- major accidents;
- combustion sources.

Trace Contaminants

Dioxins, particularly the most toxic 2, 3, 7, 8 tetra chlorinated isomer (TCDD), were present in the herbicide mixture known as Agent Orange used

during the Vietnam War in the late 1960s. Agent Orange consisted of a mixture of the 2,4D and 2,4,5T butyl esters of chlorophenoxy herbicides and 50,000 tonnes were sprayed as a defoliant. The presence of TCDD was unknown at the time but later analysis of unused drums showed the mixture to contain up to 54 $\mu\text{g/g}$ TCDD. Since this time, the manufacture of 2,4,5T has been generally replaced by other herbicides, but where it is still produced, the TCDD concentration is strictly limited to less than 0.01 $\mu\text{g/g}$.

Dioxins have been detected in some chlorophenols which have been used extensively since the 1930s as fungicides, mould inhibitors, antiseptics, disinfectants and insecticides. The most important use of the tri, tetra and penta chlorophenols is for wood preservation, but they are also used for slime control and tanning leather, and in paints and glues.

Major Accidents

There have been a number of major accidents where dioxins have been implicated — some of these cases arose as a result of trace contaminants in commercial products, but gained much publicity because of the accident:

- *Seveso, Italy 1976.* This occurred as a result of an uncontrollable exothermic process during the synthesis of trichlorophenol at the ICMESA plant at Meda near Milan. A reactor safety valve pressure disc ruptured, and the fluid mixture burst through the valve orifice into the open air, propelled by the thrust of the accumulated pressure. The cloud rose 50 m and then subsided back to earth but was wind driven over a wide area covering about 1,800 ha. An estimated 0.25 kg of TCDD was released into the environment and numerous small animals died as a result.
- *Binghamton State Office Fire, New York 1981.* An electrical malfunction in an 18-storey office building led to the overheating of a transformer. The transformer contained a mixture of polychlorinated biphenyls and chlorinated benzenes. For 30 minutes the intense heat generated dense smoke containing PCDF and PCDD and other substances, which billowed through the air shafts and contaminated every part of the building. This incident was the first outside a laboratory setting to demonstrate the conversion of PCBs into PCDF, and chlorinated benzenes into PCDD. The building has been shut since the accident, but is expected to reopen later this year following decontamination work costing about \$40m. Some skin cancers and other health problems have been reported among exposed workers but the true extent of the health hazard is still unclear.
- *Missouri Horse Arenas 1971 and Times Beach 1982.* Missouri has been called the 'dioxin capital of the United States', not because this state has more dioxin than any other state, but because it is so widespread — mainly

TCDD. There are now more than 40 confirmed sites with dioxin contamination in Missouri and the number is expected to grow. The dioxin was produced as an unwanted byproduct during the manufacture of hexachlorophene, an anti-microbial agent. Unknown at the time, the dioxin was concentrated in the residual oil after a distillation process, and a contracted waste oil recycler mixed 85,000 litres of this residue with other waste oil and used it as a spray during 1971 for the control of dust on roads, parking areas and horse arenas.

Shortly after spraying, many horses, cats and dogs and several hundred birds died. Numerous complaints of skin irritation were reported and the two daughters of the owner of the horse arenas became very ill. The real problem though was that this oil had by then been sprayed widely over the state of Missouri including a town known as Times Beach. It took until 1974 to identify the toxic material as TCDD but little was done about the problem because of the erroneously held belief at that time, that the half life of TCDD in the soil was one year or less, and the assumption was made that time would take care of the problem of the contaminated soil, if it had not already done so.

During the early 1980s, some of the Missouri contaminated sites were still being sampled by the US Environmental Protection Agency, who were coming to the conclusion that the original estimate of the half life of TCDD was grossly in error. In late 1982, sampling and analysis of soil from the town of Times Beach was started and then abruptly halted because of a massive flood that enveloped the town. After the flood had abated, the results of the soil testing were released and because of the high levels of TCDD found, residents were evacuated and not allowed to return to their homes. Homes, businesses and churches now lie abandoned, having been bought by the state and a slow process of decontamination is now under way, including the use of mobile incinerators to burn the contaminated soil. Note the 11 years that elapsed from the date of the initial contamination.

Combustion Sources

Emissions from incinerators, covering dust, smoke, toxic metals and acidic gases have long aroused concern but it is only during the last ten years that the presence in these emissions of hazardous substances, including dioxins and furans has been recognised.

It was in 1977 that dioxins were identified in the fly ash from three Dutch municipal incinerators⁽¹⁾, but quantification at that time was difficult because of the absence of authentic standards. However, since then these findings have been confirmed and virtually all waste burning incinerators examined in Europe, USA, Canada and Asia have been found to emit dioxins

and furans, at widely varying concentrations.

Although the amounts of PCDD and PCDF found varied by several orders of magnitude, some incinerator plants have been found to have emissions low enough to be acceptable on the basis of elaborate environmental impact studies. In general however, the concern about PCDD and PCDF emissions from combustion sources has caused some hesitation or delay in constructing more of these plants until it can be determined how emissions of these materials can be controlled to acceptable levels. Considerable research is at present under way, especially in Canada, USA and the Nordic countries where there is a particular desire to use combustion as a means of reducing the need for landfilling, while at the same time allowing useful energy to be recovered.

Theories of Dioxin Formation

While the origin of PCDD and PCDF from incineration processes has still not been clearly identified, they appear to arise, at least partially as a result of complex thermal synthesis reactions during periods of poor combustion, and because of their high thermal stability, can only be destroyed after adequate residence times at relatively high temperatures. There are basically three theories:

- PCDD and PCDF occur as trace constituents in the waste itself, and a proportion simply survive the incineration process;
- PCDD and PCDF are produced at some point during the incineration process from precursors such as PCBs, pentachlorophenols, chlorinated benzenes, etc;
- PCDD and PCDF are synthesised from materials not directly related to these compounds; eg, petroleum products, chlorinated hydrocarbons, chlorides, plastics and similar substances.

In the case of the **first** theory, detailed analysis has shown that while there are measurable traces of dioxins in most of the wastes examined, the levels found cannot account for the higher concentrations usually observed in the emissions.

In the **second** theory, precursors may be introduced into the incinerator as part of the waste and, when heated to temperatures below their destruction level, PCDD and PCDF may be formed. Some laboratory studies have shown this can occur.

Similarly, in the **third** theory, unrelated chemical substances present in the waste, eg, plastics, chlorides from food waste and lignin materials, have also been shown to produce PCDD and PCDF under pyrolytic reaction conditions. This theory is the one attracting most attention at the present time.

RESULTS OBTAINED FROM INCINERATORS

Many municipal waste incinerators world-wide have been investigated, of varying ages and with waste inputs ranging from 10 to 2,000 tonnes per day. The results obtained have indicated a wide range of PCDD and PCDF emissions spanning several orders of magnitude. High levels of emissions have been observed from several different types of incinerators, suggesting operational factors may have as much effect on emissions as does the design of the incinerator plant.

It has not yet been generally possible to identify routes and operational conditions that clearly point to one or any specific route for the production of dioxins and furans, and the investigational work undertaken so far has shown that many factors may be involved. When comparing results, it is important to relate clearly the level of the emissions found with the operating conditions, and these vary considerably. Unfortunately a large proportion of the published results are not related in this way and it is difficult to be precise in comparing, for example, one incinerator with another. Nevertheless included below are the results and conclusions reached in some of the more significant investigations undertaken so far.

Work in Germany on fly ash has indicated PCDD and PCDF are formed preferentially at 300°C and their formation is favoured by low oxygen and high water vapour levels. The presence of unburnt carbon in the fly ash appeared to play some role as an adsorbent for precursor compounds, and copper may also have a catalytic function.

Danish results showed high PCDD and PCDF levels were obtained with high carbon monoxide levels in the flue gases; during times of low furnace loading and with furnace and/or secondary temperatures less than 800°C.

Detailed and substantial Swedish investigations have identified the chlorine concentrations of the waste, combustion efficiency and temperature of incineration to be important factors in the levels of PCDD and PCDF produced.

In the UK, work by Warren Spring Laboratory⁽²⁾ found the PCDD and PCDF content of grate residues, fly ash and stack gases to vary widely among the plants examined, but the emissions were generally found to be lowest from plants employing grates which agitated the feed. Their results also pointed to local operational practices and feed variability to be significant factors also.

The introduction of recent legislation in Italy⁽³⁾ has required waste burning incinerators to comply with certain operating standards and emission limits. These requirements are very strict and apply to both existing and new plant

and it is probable that many plants were unable to comply with the June 1987 deadline for compliance with the legislation and may have to close down.

Italian public opinion is particularly sensitive about dioxins following the accident at Seveso, and there has been heavy criticism over the emissions from municipal incinerators there. The most striking occurrence was the closure of the Florence incinerator due to the high levels of TCDD measured in the soil areas immediately surrounding the incinerator. The origin of this TCDD has not yet been established with any certainty, and early analytical results from various other Italian incinerators, some operating similarly to the Florence plant, have shown relatively low levels of dioxins.

HEALTH EFFECTS

The assessment of adverse health effects resulting from exposure to dioxins is still a vague area and likely to remain so for some considerable time to come. Experts differ on the implications of exposure — some have calculated factors related to increased cancer risks based on lifetime exposure, and others have drawn attention directly to the increasing levels of dioxins in human breast milk and in adipose tissue.

A number of comprehensive reviews⁽⁴⁾ have been published dealing with the health effects of PCDD and PCDF, and several risk evaluations have been undertaken in various countries on TCDD, the dioxin of greatest known toxicological concern. However, isomers other than TCDD are considered to be of toxicological significance but work on these other isomers is very limited.

TCDD Equivalents

However, in order to allow for the toxicological effects of many of the other isomers, the concept of TCDD equivalents has been introduced whereby a cumulative assessment is made of the estimated toxicity rating of all the isomers with respect to the most toxic isomer 2,3,7,8 TCDD.

This concept involves the realisation that although 2,3,7,8 TCDD has been established as the most toxic isomer, in some cases the low level of this isomer can be overshadowed by the presence of a larger quantity of a less toxic isomer. In order to assess the total contribution of all isomers of varying toxicity, there have been several attempts to propose relative toxicity values to each isomer (or congener grouping), with the isomer having the 2,3,7,8 configuration being in each case assigned a higher value than the isomers in its group. An example proposed by Bellin and Barnes⁽⁵⁾ is shown in the table.

Toxicity values for isomers

Dioxin isomer	TCDD Equivalent
2,3,7,8 TCDD	1.0
other TCDD	0.01
2,3,7,9 penta CDD	0.2
other penta CDD	0.002
2,3,7,8 hexa CDD	0.04
other hexa CDD	0.004
2,3,7,8 hepta CDD	0.001
other hepta CDD	0.00001

A similar approach is taken with the dibenzofurans using a value of 0.1 as the relative toxicity value for 2,3,7,8 TCDF. In this way, the total toxicological influence of the dioxins and furans can be considered in the presence of a variety of combinations of isomers and concentrations by the simple summation of all the values.

The application of TCDD equivalents clearly requires a detailed analysis to be undertaken of each component of the emission and is very expensive to undertake (at current cost of about £1,000 per sample). Nevertheless this is the approach being followed by most countries and agencies involved in dioxin monitoring work, and should provide a better overall assessment of the toxicological effects and risk assessments associated with environmental exposure to these emissions.

Toxicological Effects

The available information on 2,3,7,8 TCDD has shown this isomer to cause lethal effects in certain laboratory animals at lower levels than any other man-made chemical, but both the lethal dose levels and toxicological effects vary considerably among different animals species. There is, however, considerably less information with respect to the toxic effects on humans, and most existing data has been derived from occupational exposure or industrial accident victims. In such cases the dose received by a given individual is virtually impossible to estimate, and the effects of similar exposures to other chemical species cannot be evaluated quantitatively in such cases.

However, there is general agreement that acute exposure to dioxins can lead to chloracne, a persistent acne-like condition that can disfigure the victim

although it does not appear to be life-threatening. Acute exposure has also led to neurological complaints, and liver disfunction but these problems are considered to be of a short-term nature. Of greater concern is the possible linking of long-term exposure of low environmental levels of PCDD/PCDF to an increased incidence of cancer (based however on animal experiments) and the suppression of the immune system (based on recent observations of a population exposed to PCDD/PCDF contaminated dust in a Missouri community).

Based on animal experiments, primarily using cancer and immunological or reproductive end-point effects, and using a safety factor of 200-1,000, a highest tolerable daily intake (TDI) has been estimated to be 1-5pg/kg bodyweight of 2,3,7,8 TCDD equivalent for humans (pg = picogram = 10^{-12} g). The levels of TCDD equivalent found in human breast milk^(6, 7) and certain fish^(8, 9) does suggest that this TDI level may be exceeded in certain countries.

Emission exposure can be direct through inhalation, ingestion and dermal absorption, or indirect through contributions to the environmental load and eventual exposure to man from food. Inhalation is the most important route of direct exposure and dispersion models are generally used to estimate air concentrations to which people might be exposed.

Inhalation

A recent World Health Organisation working group⁽¹⁰⁾ reported on emissions from a variety of modern, properly operated incinerators and calculated a worst case daily inhalation dose to be about 0.002pg TCDD equivalent/kg bodyweight, which is a very minor contribution to the TDI bodyburden of 1-5pg/kg.

For incinerators operating under irregular conditions, high waste moisture content, low combustion or afterburner temperatures, and generally poor technology, the worst case daily inhalation dose was calculated to be around 6% of the TDI value.

However, the risk assessment for TDI is very conservative because:

- There is no indication that man belongs to the most sensitive species, although infants may be more sensitive;
- Available studies indicate the concept of TCDD equivalents over-estimates the effect of mixtures of PCDD and PCDF;
- Present levels in fish and human milk reflect the summarised effect of many years of emissions.

This WHO report therefore concluded that the calculated daily inhalation doses were probably gross overestimates, and it was thought unlikely that the direct inhalation contribution of emissions from modern, well run municipal incinerators would make a significant contribution to the apparent daily intake of PCDD and PCDF.

Indirect Exposure

Recent studies abroad have shown increasing levels of PCDD and PCDF in human breast milk but an assessment of the significance of these findings and possible correlation with incineration has not yet been undertaken. There is, as yet, no evidence for any contamination to drinking waters.

No estimate has been made at the present time of the indirect contribution of incineration to the background daily dose, but there may be certain population groups — those consuming milk produced solely in the immediate environment of an incinerator, and those consuming well above average meals containing certain fish — that may receive relatively higher exposure.

CONTROL OF PCDD AND PCDF IN THE ENVIRONMENT

If it is assumed that the presence of PCDD and PCDF as contaminants in certain chemicals has now been reduced to acceptable levels, and that effective control of chemical processes will minimise accidents such as that at Seveso, also that the use of certain chemicals, eg, PCBs in transformers, has been or is being phased out, then the remaining environmental source of PCDD and PCDF requiring control is that of emissions from combustion processes.

It is known that PCDD and PCDF are produced albeit at very low levels from certain motor vehicle exhausts⁽¹¹⁾, woodburning stoves⁽¹²⁾, forest fires, stubble burning and certain other industrial processes. However, the major sources are still considered to be incinerators burning household, industrial, and clinical waste, and even crematoria are implicated.

The investigative work undertaken so far has shown the level of PCDD and PCDF emissions from municipal incinerators to vary widely and the factors causing these variations are not yet thoroughly understood. Nevertheless there is general agreement that conditions which improve or optimise combustion efficiency, including relatively high furnace temperatures and long residence times, together with high turbulence and excess oxygen, generally produce low PCDD and PCDF emissions. As an example, the Italian legislation requires flue gas temperatures to be not less than 950°C, and with residence times of not less than 2 sec for domestic and industrial waste, where the chlorinated organic materials present have a chlorine concentra-

tion of not more than 2%.

Abatement

In addition to modifications to design and combustion control facilities, some of which may be economically impractical or even impossible in the case of some of the older incinerators, the installation of flue gas cleaning or abatement systems will also considerably reduce PCDD and PCDF emissions to the environment provided they operate efficiently.

A large proportion of PCDD and PCDF produced during the incineration process is associated with the fine particulate material, probably as a result of strong adsorption on to the surface of this dust shortly after formation. The installation of abatement systems, eg, dust and grit settling chambers, cyclones, wet and dry scrubbers, electrostatic precipitators and fabric filters, provided they operate efficiently will reduce the levels of dust and/or acidic gases and so reduce the amounts released to the environment through the stack. However, careful attention may need to be directed towards the disposal of the collected residual ash.

The installation of gas cleaning systems is virtually automatic nowadays to new incinerators because of tighter environmental controls following the introduction of legislation, or following pressure from environmental groups. Very tight controls have been introduced in Sweden following the lifting of the moratorium on the building of incinerators, and these particularly apply to dust and dioxin levels, requiring the installation of electrostatic precipitators and fabric filters. Italy is recommending some pre-sorting and separation of glass, paper and batteries prior to incineration, and in some areas of the country, the authorities are phasing out the use of plastic bags and introducing large containers to handle waste.

In comparison to the action other countries have taken, the UK has taken a less reactive approach. The DoE has commissioned a series of investigations of municipal incinerators, and a contract to assess background dioxin levels of soil samples taken over a 50 km grid throughout the UK is almost complete.

The recently published British Standard⁽¹³⁾ applying to incinerators burning hospital waste introduces limits on grit and dust in line with that recommended by the 1974 working party, and also specifies a maximum carbon monoxide concentration and a minimum combustion temperature of 800°C with a minimum flue gas residence time.

A possible EC directive on municipal waste incineration is at present under discussion in the UK and, if introduced, is likely to set tight emission limits, establish monitoring frequencies and set combustion conditions. Under

particular consideration is a requirement that both new and existing incinerators burning municipal waste should be monitored on an annual basis for dioxin emissions.

CONCLUSIONS

The dioxin issue is a subject that will be with us for some years to come. The toxicologists need time to assess the health implications of long-term exposure to PCDD and PCDF in the environment more accurately, and risk thresholds need to be more clearly defined.

From a regulatory viewpoint, greater attention must be directed towards the standardisation of methods used for sampling and analysis of gaseous and particulate emissions, especially when relating the results obtained to the incinerator operation.

More research is necessary into the formation of dioxins in incinerators, as well as the relative importance of PCDD and PCDF generated by incineration when compared with other forms of combustion.

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BUILDING SOILING AND THE STONE CLEANING INDUSTRY

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INTRODUCTION:

It is now being increasingly accepted that particulate emissions from vehicular traffic are a major cause of fabric soiling as well as contributing to the general deterioration of atmospheric quality within the urban environment. Research conducted at the Urban Pollution Research Centre, Middlesex Polytechnic has explored the relationships between the properties of airborne particulates and the soiling of urban building fabric, and to further develop these relations as a basis for cost-benefit assessment. This article briefly describes one of the methods used to determine the costs of particulate soiling.

Method

Surveys were conducted of two types of company.

1) British Stone Federation Members:

A questionnaire survey of all 85 companies registered with the Federation which undertake stone cleaning was carried out during 1987. Of the 85 companies originally identified, 18% returned the questionnaire stating either that the amount of stone cleaning work undertaken was negligible or that they used sub-contractors. In all 37% of the companies replied who operate in this market, 21% were from postal replies and a further 16% from telephone or personal visits.

2) Unregistered Companies:

It was apparent that there were many other stone cleaning companies within the U.K. not registered with the Stone Federation. A total of a further 450 companies were identified in the Yellow Pages as advertising stone cleaning services. An 11% partial response rate was achieved for such companies.

The questionnaire sent to these two types of companies was divided into three main sections which sought to explore

- (i) the principal customers of the industry and the motives for having a building cleaned;
- (ii) the cost of cleaning by various methods, the recommended cleaning frequency for a given variety of urban locations and the factors responsible for any noted difference in frequency;
- (iii) one major area of the country where cleaning occurs, the amount of the market share held by the company and their turnover for 1985/86, with their estimates of the value of the National stone cleaning market per annum.

The results presented here are those of both the registered and unregistered stone cleaning companies within the UK combined.

The Industry's clientele

The vast majority of the respondents stated that more than 60% of their work came from the private sector; a commonly quoted ratio was 80:20 private to public sector distribution. However, it was noticeable that many companies serving Scotland and the North of England quoted the public sector as their most frequent customers.

Figures 2 and 3 indicate the categories and proportion of customers served within the private and public sector respectively.

Figure 2. The categories and proportion of customers served within the private sector

* Companies in Scotland and the North of England generally stated a greater proportion of domestic housing share than is represented by the mean response of replies.

Figure 3. The categories and proportions of customers served within the public sector

The principal reasons identified by clients in both the private and public sector for having a building cleaned were appearance (39%) and because such cleaning formed an integral part of their scheduled maintenance programme (28%). A further 15% indicated their cleaning was undertaken to identify defective structures. (This was identified as the sole reason for cleaning within the P.S.A.) The remaining 18% quoted increase in trade and value of the property, together with a need for their buildings to blend in with their surrounds. These results are illustrated in Table 1 below.

When questioned on the benefits the customers perceived from having their buildings cleaned, the responses were rather different to those given as the initial reasons quoted by the clients for commissioning the cleaning work. Nearly 30% felt cleaning gave the clients protection of the building fabric, whilst only 20% quoted the appearance factor. A further 19% of respondents felt that customers gained from increases in their property value as a result of cleaning and 11% stated that it exposed the entire building fabric so a detailed inspection survey could be done. The remaining 12% indicated increases in trade and a better social environment as their principal benefits. A decrease in vandalism and graffiti were mentioned in this last category by 2% of stone cleaning companies as a benefit of cleaning building fabric. These results are illustrated in Table 2 below.

The companies were also asked whether the motives of the two sectors for having a building cleaned were different. The majority said there was no difference between the two. It is interesting to draw attention to the fact that in response to another question the companies noted that 68% of the private sector only cleaned the front of the building compared with 44% for the public sector. This discrepancy appears to be due to the desire of the private sector to maintain appearance and image of the building, whilst the public sector is primarily concerned with the protection and longevity of the building and its fabric.

It is pertinent to note that where customers were constrained by lack of finance, only front facades were cleaned. This was clearly for 'aesthetic' reasons, though these authorities also identified front facades as being most soiled. This latter point provides some circumstantial evidence for the vehicular source of the soiling problem.

Table 1: Reasons why clients clean their buildings

Appearance:	39%
Part of a maintenance programme:	28%
To identify defects:	15%
Increase trade	9%
Increase in value of property:	6%
Blend in with new extension of building:	3%

Table 2: Benefits to clients for cleaning their buildings

Protection of building fabric	29%
Appearance	22%
Increase in property value	19%
View of building fabric	11%
Increase trade	8%
Improved 'social' environment	2%
Decrease in vandalism and graffiti	2%

Cleaning Prices

Companies were asked to quote a price to clean a stone facade per m² using a range of methods (excluding scaffolding costs). These results are illustrated in Table 3 below:

Table 3: The ranges in price for different stone cleaning techniques

Method	Range of prices per m ²	Average cost per m ²
Water clean	£1–20	£2. – £3.
Degrease and water clean	£2–12	£3. – £4.
Dry Abrasive	£2–14	£5. – £6.
Wet Abrasive	£2–20	£6. – £7.
Use of Sealant after cleaning	£1–14	£2. – £3.

When asked to price the cleaning of a 550 m² Portland stone building of the 1950's, 20 metres in height and with simple architecture (excluding scaffolding). Prices quoted ranged from £900 to £11,000. However, over 50% of the quotes lay between £1500 and £2000. This also indicates the market's competitiveness, as was likewise borne out with the majority of replies being close to the average prices given in Table 3.

Cleaning Frequency

The survey asked how often would water washing of a Portland stone building be advocated if it was located in a major city. Over 46% said every 5 to 10 years. If situated in a town the most common reply was every 10 – 15 years whilst if located in the country, a frequency of every 60 years.

The most frequent answer to explain these different frequencies and sources of soiling was traffic and vehicular pollution (42%). Industrial emissions were thought to be responsible for 17% of the deposit, whilst grit and dirt 'dustfall' being responsible for a further 23%.

Stone Cleaning Market

The value of the UK stone cleaning market per annum was valued at between £5–100 million nationwide. However, only 21% of replies actually tried to assign a national cost. Perhaps not surprisingly some companies were not prepared to give their annual turnover. Others were not able to estimate it since stone cleaning activities often amount to less than 15% of their turnover for stone cleaning is rarely done by itself but rather as a part of a major renovation and refurbishment programme. In these circumstances, it is therefore difficult for companies to isolate a realistic figure for their stone cleaning activities alone. However, an average turnover of £135,000 per year was calculated on the available data, and if it is assumed that this is applicable to the 535 companies within the U.K., the total value of the market amounts to £74 million per annum. If this latter figure represents only 15% of the companies turnover, then their total turnover would be in the order of £490 million per annum for the U.K. The stone cleaning market has clearly increased rapidly since 1972, when the market was valued at less than £2 million per annum by the Programme Analysis Unit as part of the Department of Trade and Industry.

The cities most frequently identified where stone cleaning companies were active included London (over 60% of companies stated they did some work there), Liverpool, Manchester, Bath, Bristol, Sheffield, Glasgow and Edinburgh. Cities in the Midlands, Wales, Devon, Cornwall and North East England did not feature in many replies. The location of companies (in Fig. 1) does highlight some of the business activity identified above.

Future trends

Over 75% of respondents predicted an increase in trade for the future, especially from the domestic housing sector. Many also felt the 'sandblasting mania' of the North of England was in decline, partly due to the destructive effect this method can have in untrained hands, and also because of the health risks for the operator. In its place an increase in chemical cleaning is expected.

A surprisingly large proportion of the Stone Federation members voiced concern over the growth of the 'cowboy' element within the market. This group was blamed for discrediting the work of Federation members as well as doing irrevocable damage to many historic buildings. Of the 535 companies identified as undertaking stone cleaning work only 16% belong to the Federation. Non-members appear to be inundated with work as they undercut the tenders of the registered companies. Thus, the market appears to be very competitive and over 72% of the companies saw their prices only increasing by the rate of annual inflation or even less during the next five years.

Further reviews will highlight the customers reaction to stone cleaning, the amounts

typically spent by some sectors within the private and public spheres, as well as sources and rates of urban soiling.

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PERCEPTION OF AND REACTION TO NOISE

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INTRODUCTION

The harmful or potentially harmful effects of many indoor pollutants are relatively clearcut. Except at the very high sound pressure levels associated with industrial processes, this is not the case for indoor noise pollution. This is because many types of noise as heard indoors have no proven effects on the physiological health of the individual but cause dissatisfaction through activity interference or undesired intrusion into the individual's perceptual world. Activity interference can occur whenever the individual is engaged in any directly noise sensitive task such as listening to speech or music or where an individual requires relative silence to assist in concentration or dropping off to sleep. The type of undesired intrusion caused by a thoughtless neighbour's TV, hi-fi system or violin practice can cause considerable interference with rest and relaxation even at extremely low noise levels.

Nevertheless, some environments can be perceived as being "too quiet" by some individuals, indicating that a certain amount of noise can be a good thing in some applications. A particular example of this is railway terminus background music which, however much the particular programme may not appeal to individual taste, has definite advantages in reducing overall stress levels in the probably belated commuter crowds. Even in the industrial situation, there has been some resistance to the wearing of recommended hearing protection devices on the grounds of allegedly interfering with the perception of subtle acoustical cues as to the satisfactory progress of industrial processes or with the perception of warning sounds. Thus it can be seen that whereas a certain amount of sound is always present in any community or human undertaking, the precise point at which a sound becomes unwanted, and thus a noise, is very dependent both on the nature

of the source, and on the situation of the exposed individual. Despite the investment of considerable resources in noise research during the past 30 years there are still large areas where our knowledge is very limited as a result of the complexity of the problems involved.

NOISE EFFECTS

Noise Levels

In general, noise does not damage buildings, except in specific circumstances such as sonic boom and structural resonances excited by noise from sources such as artillery ranges or heavy vehicles passing over damaged road surfaces. This is because even very loud noises have minimal acoustical power. A sound pressure level of 194 dB corresponds to an acoustic pressure of one atmosphere (fifteen pounds per square inch or 10^5 Newtons per square metre). A typical conversational maximum sound pressure level of 74 dB corresponds to an acoustic pressure of one millionth of this, or fifteen millionths of one pound per square inch. The faintest sounds that can be heard have an acoustic pressure of one five thousandth of the speech sound at 74 dB SPL. Thus it can be seen that the human ear is exceedingly sensitive and correspondingly vulnerable to acoustic pressures that would produce insignificant displacements in typical building structures.

Noise Induced Hearing Loss

The UK Code of Practice for reducing the exposure of employed persons to noise specified a limit of an equivalent continuous sound level of 90 dB(A) as averaged over an eight-hour day, with higher levels for shorter exposure periods. Noise induced hearing loss is a well-documented occupational risk for workers in higher continuous noise levels, with a significant occurrence of disability even at lower exposure levels. There are currently moves to reduce the 90 dB(A) L_{Aeq} (8 hour) exposure limit to take account of this remaining risk as cost-effective noise control technology is developed. Short-term exposure to higher noise levels can cause a temporary threshold shift (TTS), characterised by a sensation of "ringing in the ears". While full sensitivity and discrimination normally return after TTS there is some evidence from animal studies that even TTS could be associated with permanent damage to the inner ear. The precise damage mechanisms are not fully understood, owing at least in part to the inaccessibility of the inner ear structures to histological examination without causing major disruption.

Very high acoustic pressures can cause immediate rupture of the ear drum or physical damage to the middle and inner ear structures, although the likelihood of damage is dependent on the individual concerned. The threshold of

rapidly occurring mechanical damage is thought to be around 150 dB SPL, a level which can easily be exceeded in the vicinity of small arms, artillery and pyrotechnics. High level transient sound can often be deceptive as the ear exhibits a finite integration time in terms of the development of loudness. Thus transient sounds associated with explosives might not sound as loud as a continuous sound at the same level would be despite having a similar potential for causing acoustic trauma. Such high sound pressure levels are extremely rare in buildings.

Physiological Responses

Whilst excessive industrial noise exposure and the costs of appropriate control measures remain serious problems for a small percentage of society, general exposure to everyday noise can make a significant contribution to disamenity in many ways. There is much interest in the effects of noise in terms of physiological response, particularly in Europe. Unexpected noise or an expected noise occurring at an unpredictable time can elicit an orienting or a startle response with associated effects on the autonomic system. Cardiovascular, respiratory, pupil dilation, skin resistance and hormonal responses have all been measured in response to such stimuli. Whilst some workers believe that these responses could be precursors of disease it is not known whether there is in fact any cause and effect relationship. Autonomic system responses to sensory stimulation are a necessary part of behavioural responses to environmental situations in terms of gathering more information or preparing for action. Nevertheless, they indicate that noise can be considered as a stressor with the associated theoretical consequences of a perceived lack of control of the noise source by the exposed individual where the noise source makes an uncontrolled intrusion.

Speech Interference

Whilst it is meaningless to rank order the sensory modalities in order of importance to the individual, it is certain that the sense of hearing provides considerable information to the individual in terms of being able to construct a perception of their external environment and in terms of being able to communicate with others. The sense of vision is highly selective in that the individual can avoid overstimulation due to complex visual fields by directing his gaze. This is not possible in respect of the sense of hearing. Speech communication can be surprisingly resistant to the effects of interfering noise or other distortions, primarily due to the powerful ear and brain mechanisms which have evolved to extract the required information and to the contextural redundancy present in normal speech. For example, speech babble produced by recording multiple talkers simultaneously can be

very distracting in terms of the intelligibility of an experimentally presented word list, but it can be made to be much less distracting if the speech babble and experimental word list are presented separately to the left and right ears using headphones. This is an example of an experimentally contrived assistance to the ear and brain selectivity mechanism which could not normally be applied under everyday circumstances.

Thus speech communication can be disrupted by intruding noise which either masks the relevant speech components so that they cannot be distinguished from the background noise, or confuses the ear and brain speech reception mechanisms as in the case of interfering speech babble. These types of interference can apply to conversation, use of the telephone, TV and radio listening, and public address in auditoria or large public spaces. The masking effects of background noise in different frequency bands are relatively easy to predict by using the well known Articulation Index or similar more recent techniques such as the Dutch Speech Transmission Index but these methods based on a weighted sum of signal to noise ratio in different frequency bands do not account very well for more complex forms of signal degradation and make no allowance for intermittent interference, or differing amounts of contextural redundancy in the speech.

Sleep Interference

Sleep can be considered as another "task" which is sensitive to interference by intruding noise. Here research has traditionally divided into two main streams. First, physiological scientists have conducted many experiments with instrumented sleeping volunteer experimental subjects both in the laboratory and in their own homes. They have discovered that intruding noises can cause premature changes in sleep stages so that individuals might spend less time in the deeper sleep stages during the night. Second, social statisticians have explored the relationships between reported sleep disturbance as measured using social survey interview techniques and noise exposure as measured or predicted by acousticians. There tends to be rather poor correlation between reported awakenings and historical records of intrusive events such as aircraft flyover noises and, similarly, rather poor correlations between reported sleep quality and observed behavioural awakening or sleep stage change patterns. However, it is possible to infer that intrusive noise does not affect sleep at all at indoor levels below about 35 dB(A) and also that reported sleep disturbance is not significantly increased by aircraft noise, for example, until the exterior noise levels exceed approximately 82 dB(A).

These remarks on sleep disturbance must be qualified by specific reference

to the particular sensitivity of some individuals to recognisable noises during the process of dropping off to sleep. This phenomenon is more likely to be due to the distracting effect of the information content of the sound than any simple relationship between noise level and arousal level. However, this does not mean that this effect should be discounted when making a practical assessment of a reported noise problem.

Task Interference

Other tasks do not appear to be directly affected by noise if there is no requirement for the assimilation of acoustic information and the noise does not possess a high information content. Thus mental arithmetic and similar tasks are not affected by bland continuous noise at even relatively high levels, whereas a sound with some information content, ie. by being speech-like in some way, can be considerably distracting. An experienced machine operator might be perfectly able to solve crossword puzzles in the presence of relatively high noise levels for his machine, yet will rapidly be alerted from his crossword puzzle solving task in the event of an unusual sound indicating a fault or hold-up of some kind. This effect can be used to advantage by adding an artificial background noise from heating and ventilating plant or even loudspeakers to ensure conversational privacy between adjacent sections of an open plan office. This not only assists information security but also allows adjacent staff to work without the continued distraction of partially overhearing other conversations which may or may not be relevant to them.

Health Effects

Other than noise induced hearing loss, there is not yet any conclusive evidence for any general adverse effects of noise on health. Limited studies suggesting increased rates of foetal abnormality and cardiovascular disease near certain American airports were not properly controlled for the many other socio-economic and environmental factors that could have influenced the observed morbidity. From the viewpoint of the epidemiologist, different individual noise exposure levels can be extremely difficult to estimate merely on the basis of noise contours derived from acoustical prediction and sample measurements. Individual noise exposure depends not only on the place of residence but also on the workplace, on travel, on social activities and on the way in which the dwelling is occupied. These measurement errors can seriously affect the accuracy of social surveys on reported environmental quality but they are likely to completely swamp statistical relationships which might be found between low likelihood population responses and poorly estimated individual noise exposure. The West London survey on

aircraft noise and the prevalence of psychiatric disorders did not find a consistently greater number of chronic symptoms or a greater use of health services in the higher aircraft noise exposure areas despite a follow up study showing increased skin conductance responsivity could in isolation have been taken as a result implying potential damage to health.

Subjective Impressions

Noise effects can be classified into those effects that can be measured objectively, such as noise induced hearing loss, a drop in performance levels achieved at some task such as listening to word lists, or an increased number of behavioural awakenings during a sleep period; and into those effects that can only be measured subjectively by the use of questionnaires or psychological scaling techniques. In many circumstances the suitability of any indoor noise environment for its intended purpose will depend upon subjective impressions of the relative importance of the different objectively measurable noise effects that might occur and hence the relative weightings that should be applied in order to aggregate together an overall rating or figure-of-merit. Subjective impressions of an indoor noise environment can be presumed to take account of these weightings as they apply to an individual or a representative group. The research worker's task is then to attempt to tease out the underlying relationships from a study of the physical qualities of the indoor noise environment and the relevant subjective impressions.

The problem with measuring subjective impressions is that they are dependent upon individual attitudes and a certain amount of measurement bias. To take the example of aircraft noise, there have been many surveys of community response to aircraft flyover noise in the vicinity of major airports both in this country and abroad. These studies have indicated a generally increasing level of mean reported annoyance or dissatisfaction with increases in aircraft noise exposure but the data require a political or administrative interpretation before they can be used for the purpose of setting aircraft noise exposure criteria. This is because the statistical spread in the data due to attitudinal differences between individuals and due to measurement errors and bias would make any discontinuity in the aircraft noise exposure-dissatisfaction response relationship hard to detect even if it existed. A discontinuity would imply a sudden increase in dissatisfaction at a particular aircraft noise exposure threshold which could be used for setting exposure criteria. In addition, aircraft noise dissatisfaction surveys cannot introduce the concept of the costs of noise control on the grounds of potentially biasing the respondents in the airport's favour. The respondents' dissatisfaction scores are therefore made in isolation and require interpretation if they

are to be used in any absolute sense. For example, a score of five on an aircraft noise dissatisfaction scale of from zero to nine does not necessarily mean the same degree of actual nuisance as a similar score in respect of some other nuisance.

Perceptual Constancy

To take the example of aircraft noise exposure further, there is some evidence that dissatisfaction scores are based, at least in part, on subjective impressions of the magnitude of the noise source in addition to subjective impressions of the absolute noise level indoors. Thus a particular aircraft noise could be rated as highly annoying even at a relatively low noise level indoors because it is perceived as being a particularly powerful noise source to produce significant noise levels from a relatively large distance in comparison to nearby road vehicles. This effect is based on the psychological concept of perceptual constancy whereby the individual tends to construct a stable perception of his exterior environment from the varying sensory cues available to him. Thus a listener indoors may partially compensate for assumed facade attenuation when rating the noise of an aircraft or road vehicle passing outside. Owing to the relative distances involved this effect could tend to bias aircraft noise dissatisfaction scores upwards in comparison to road vehicle noise dissatisfaction scores. In addition, it could reduce the apparent benefit of various noise control measures in comparison to that expected from the exposure/response relationships found across the community as a whole.

Halo and Expectation Effects

The halo effect is another potential bias on dissatisfaction scores. This effect refers to the tendency of subjective judgements to be influenced by other, at first sight, irrelevant attitudes towards the noise source or sources. For example, residents near to an airport who are connected with the airport in some way through employment or business might be expected to report less dissatisfaction with aircraft noise. In addition there are other subjective expectation effects. This refers to the tendency of subjective judgements to be influenced by the normal range of noise levels associated with any particular noise stimulus. For example, respondents interviewed during a period of relative inactivity due perhaps to an unusual traffic pattern or runway use pattern might report low dissatisfaction scores in comparison against their normal exposure level and not in relation to any absolute interpretation of the dissatisfaction scale.

Intermittent and Continuous Noise

Comparisons between dissatisfaction scores for intermittent and continuous

noises may be confounded by the extent to which respondents integrate their experience of the intermittent noise when forming an opinion. For example, dissatisfaction scores for aircraft noise may refer to the level of intrusion felt at the time that an aircraft flyover occurs and not to the presumably lower level of dissatisfaction which might reasonably be expected to occur if a limited number of aircraft flyovers are integrated over the whole day. This effect could contribute to the well known higher reported dissatisfaction scores for aircraft noise than for a more continuous noise such as road traffic at the same average noise levels (L_{Aeq}), at least over the range of noise levels where exposure to either noise source can overlap. The standard dissatisfaction rating scales for the major aircraft noise surveys in the UK are filtered by an activity interference check list ("Do aircraft ever?") followed by an event specific questionnaire item ("When the aircraft how annoyed do you feel?"). This hypothesis is further reinforced by other apparent discrepancies between total noise dissatisfaction and source specific noise dissatisfaction where the source specific response scores can often be greater than the total response scores in the case of intermittent noise sources present against a continuous background noise. This hypothesis adds to the difficulty of interpretation of studies of multiple noise source environments whereas the majority of noise studies in the literature have concentrated on single noise sources even to the extent of ignoring other noise sources that were undoubtedly present, possibly at higher exposure levels than those due to the noise source under investigation.

Static and Dynamic Exposure-Response Relationships

Field studies of community response to noise exposure are open to many new sources of bias unless they are restricted to a near instantaneous sampling plan across a range of noise exposure conditions at different community locations. This type of study can be used to establish a static exposure-response relationship across a community as a whole under static conditions that does not predict how any section of the community will react to dynamic changes in noise exposure level. Provided that it is otherwise unbiased and accurate, the static exposure-response relationship can only be used to infer the potential long term dissatisfaction of any newly exposed section of the community without reference to the likely influence that that new community's previous experiences of noise exposure will produce. In practice, a newly noise exposed community might react more adversely than predicted from the static exposure-response relationship on the basis of the worsening of their original environment. This argument has been used to justify lower noise acceptability criteria for noise sensitive developments in "green field" locations and has been opposed on the basis that any initial

strongly adverse reaction is an initial response only that will eventually settle back to the expected level of response from the static exposure-response relationship.

In reality, over a period of time, most communities see changes in the degree of noise exposure. These dynamic exposure effects are not taken into account by field surveys as it would be impracticable to do so, particularly in the case of the tendency of some sections of the population to move house fairly often. It has been argued that residents immediately adjacent to major noise sources (eg airports or motorways) become self selected over a period of years as less sensitive than average as the more sensitive of the population gradually move away. This sensitivity self-selection model explains initial strongly adverse reactions on the basis of a latent period during which the more sensitive of the population retreat from the exposure. There is little evidence to support this model particularly as convenient locations and other benefits often appear to outweigh the reduction in the proportion of the population who might be prepared to move into a noise exposed area in terms of the relative house prices in quiet and noisy areas.

There have been some studies of dynamic exposure situations, for example before and after various noise control measures. In these cases it is difficult to separate out the effects of the respondent's satisfaction at having had something done about his problem from the actual effects of the noise reduction achieved particularly in the light of possible perceptual constancy effects. Noise insulation of the building facade does not alter exposure outdoors and might often be applied only in response to some increase in outdoor noise exposure in any case. Full experimental control would require either blind studies or exposure condition balances that might be impossible to achieve in practice. Therefore the most useful purpose of such before and after studies might be to explore the degree of satisfaction with the work directly without addressing the question of whether the degree of acceptability of the noise exposure has changed.

Laboratory Simulations

The laboratory simulation approach provides a useful tool for the investigation of these dynamic situations by enabling the adoption of repeated measures experimental designs. A simulated domestic living room (or other appropriate indoor space) with concealed or otherwise unobtrusive loudspeakers can be used to reproduce realistic and representative indoor noise environments to representative samples of the population who would normally be assumed to be otherwise disinterested in the noise exposures except insofar as they are asked for their opinions. At present there are simulated living room listening laboratories at ISVR, the Transport and Road

Research Laboratory and the National Physical Laboratory and at other institutions both in the UK and abroad. The laboratory simulation approach suffers from the major disadvantage of limited noise exposure condition duration. In addition, it is difficult to be certain of the extent to which experimental subjects in the laboratory will contrive their responses in order to comply with their perception of the experimenter's wishes rather than giving a true response. However, laboratory-field comparisons have shown good correlations in the sense of being able to derive experiments which are only feasible in the laboratory. Much of what we know today in respect of noise scales and indices derives not from field work but from laboratory studies, many of which were carried out in highly controlled acoustical environments such as anechoic chambers in order to avoid as much as possible the potentially confounding effects of field variables. The laboratory study can be thought of as providing a means for the development of scales of annoyance or dissatisfaction potential associated with noise environments, usually in a relative sense only as the powerful effect of the knowledge that an individual has to live with the noise environment he has at his personal dwelling place, does not apply.

DISCUSSION

Whereas noise-induced hearing loss associated with high industrial (or recreational) sound pressure levels is now relatively well understood and "safe" exposure criteria have been adopted, there is no consensus on the basis of research alone to determine acceptability criteria for community noise. Regulatory and administrative bodies and the courts are often forced to rely on the experience of expert witnesses for assistance in making decisions which might have profound implications either for the development of industry and transportation or for persons living in the vicinity of these developments. Many forms of noise control are expensive to implement or involve considerable inconvenience, for example night time moratoria or curfews. In many cases expert witnesses disagree, leading to serious problems for the non-expert adjudicators, and a test of reasonableness is often the only satisfactory approach.

The reason that experts can disagree is because the results of research are often open to different interpretations dependent upon point of view. For example there appears to be good evidence from field studies that aircraft noise is more annoying than road traffic noise at the same exposure levels but, as discussed above, this result depends on a number of assumptions as to the comparability of the data which might not be fully justified. Therefore, we are left with an established system of noise scales, indices and acceptability criteria which turn out upon detailed examination to be rather more

arbitrary than at first sight might appear. This is unfortunate but the situation is not hopeless. First, even arbitrary criteria are better than none at all. Moves towards the adoption of a common noise index for all noise sources aid comparisons providing that the possibility of errors in specific circumstances is allowed for and can be rectified according to the results of research in the future. Second, complete and thorough investigation of the shortcomings of previous and current practice in the world of noise assessment might indicate promising future lines of research to build on the best of what has gone before.

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Reader Enquiry Service No. 8802

NSCA SURVEY ON AGRICULTURAL POLLUTION 1987

How much of a problem is agricultural pollution? Many people may have an instinctive feeling that the farming industry has become a major polluter, but to get a clear picture of problems 'from the horse's mouth', NSCA circulated a questionnaire to all Environmental Health Departments throughout the UK. The questions related to the number of complaints received; the EHO's perceptions of the real problems, and went into some detail about noise pollution. Here are the results.

Part 1 – Data

260 Environmental Health Departments from all over the UK responded to the 1987 questionnaire on agricultural pollution. A summary of results is given below.

1. Regardless of the number of complaints received, 77% of EHDs (201 out of 260) considered that agricultural activities created actual or potential problems in their areas.

2. Of these 201 authorities, particular problems were given as follows;

Problem	No of Authorities	% age
Noise	115	57
Straw & stubble burning	131	65
Odour	197	98
Pesticide use	82	41
Others	32	16

The 'Others' category covered a multitude of sins; water pollution from silage or slurry effluent; dust from crop driers; flies from intensive livestock units were most often mentioned.

3. With regard to actual complaints, the following figures were received by authorities during 1986.

Problem	No of complaints	No of authorities	Average per authority
Noise	1051	129	8
Straw & stubble burning	782	121	6
Odour	3858	185	21
Crop spraying: aerial	178	57	3
ground	99	57	2
Others	138	34	4

'Others' included Clay pigeon shooting; nitrate levels in private water supplies; pollution from silage liquor and slurry; sewage sludge spreading; dust from silos; flies.

4. Complaints about noise were broken down by source, as follows.

Source	No of complaints	No of authorities	Average per authority
Bird scarers	750	127	6
Machinery/hours of use	380	70	5
Buildings (fans etc)	257	66	4
Animals	507	48	10
Others	44	9	5

By far the majority of 'Other' complaints related to clay pigeon shoots.

Part 2 — Commentary

Odour

Of those authorities experiencing pollution problems from agriculture, an extraordinary 98% mentioned odour, making it by far the commonest cause of complaints about

agricultural activities. In many parts of the countryside, local people are tolerant of odour from farming; it can, after all, be a messy business. However there are two factors which exacerbate the problem.

Firstly, increasing numbers of people unaccustomed to farm odour are coming into contact with it, either because of agricultural activities practiced at the urban fringe, or because of the desire of urban workers to live in 'unspoilt' rural areas. A telling comment comes from an Assistant Divisional EHO in the West Midlands; "The authority is a largely industrial area which shares a boundary with green belt land. This has led to the situation where the areas adjacent to countryside have been developed as 'commuter belt' residences. A consequence of which is that 'Townies' are now paying high house prices to live adjacent to the countryside. However they do not show sympathy or understanding to the practices of the countryside which makes their homes so pleasant to live in. This lack of tolerance is the main problem since local farmers are also unsympathetic to those people who come to live in 'their' area".

Secondly, the disposal of animal slurry and sewage sludge by spraying onto land is a recurring cause for complaint, even in solidly rural areas. A typical comment from a Principal EHO; "Our main problem in the area is odour caused by spreading of animal slurries both from pigs and cattle. It has been our experience that this odour is unacceptable even in rural areas where people are prepared to accept normal country smells. Widespread investigations have failed to provide a suitable answer and the Ministry of Agriculture have been less than helpful. The farmers and their Union are convinced that the farmers' right to spread overrules the rights of nearby residents not to be caused nuisance ... Another important factor is that farmers appear to be able to install expensive slurry collection systems without the need for planning consent and once the expense is incurred it is obviously more difficult to persuade him to adopt other means of fertilisation".

Although slurry spreading on land is an intermittent problem, it is clearly a major headache for many authorities. More persistent odour problems arise from intensive livestock units, particularly pig and poultry farms; "There should be planning controls to prevent these being established close to residential properties", responded one EHO.

Straw and Stubble Burning

It is becoming clear that, despite new byelaw provisions, the burning of crop residues continues to be a problem in many rural and urban fringe areas. Nor are the problems limited to cereal crops; burning of oilseed rape and potato haulm has also caused local nuisance. Across the country the picture varies. Some local authorities have observed improvements – "Problems with stubble burning have declined within the last few years following the implementation of byelaws and vigorous enforcement of same", reported one EHO. The majority of authorities, however are finding that burning is still on the increase – "This District Council is predominantly rural in character, and I would estimate somewhere in the region of 1,000 burns take place during the harvest period. Whilst the authority has adopted byelaws, in practice they are totally ineffective in tackling the

problems associated with this practice, particularly that of atmospheric pollution. The only answer remains for a total ban", wrote an Assistant Director of Environmental Health. The third NSCA report on stubble burning gives a more detailed picture of the 1986 burning season.

Noise

As most country dwellers are aware, the 'peace of the countryside' is an illusory concept. Many farming activities are inherently noisy, particularly with increased mechanisation. Agricultural machinery, crop driers, intensive livestock units and food processing plants can all cause annoyance. Transport of crops or animals by lorry is another source. In our survey, the majority of complaints related to noise from animals kept in buildings, and from bird scarers. Despite the existence of a NFU code of practice on bird scarers, there is clearly widespread ignorance or abuse or guidelines. Some EHOs were themselves unaware of the code.

Agrochemical Pollution

Most people would probably rate pollution from chemical pesticides and fertilisers as a major problem in rural areas, and the effects are well documented. Although they give rise to relatively few public complaints, the incidents reported are often very serious. Damage to wildlife, crops and commercial fishponds, particularly from aerial spraying, was mentioned by a number of authorities. A typical report — "The driver of a private motor car was covered by chemical spray from a helicopter spraying fields. Investigations indicate failure to comply with Aerial Application Certificate in respect of the restriction of chemicals to the target area; minimum clearance of aircraft from roadway and calling into question the judgement of the operators in accepting the task. The incident has been reported to both the Civil Aviation Authority and the Health & Safety Executive with a view to action being taken for possible contraventions of the Air Traffic Order and Health & Safety at Work Act 1974".

Water Pollution

In the "Other" category of complaints, a significant number related to pollution of waterways and water supplies. "A major source of complaint is the storage of farmyard slurry/manure. This also accounts for many complaints of contamination of ditches and water courses", noted one authority. "There are 56 private water supplies in this area and a significant proportion show high nitrate/nitrite concentrations", comments another.

Part 3 — Overview

British agriculture is undergoing a period of re-evaluation. The effects of intensification have brought both benefits and costs, and there is a growing understanding of the environmental consequences of new farming technologies. Whilst pundits may ponder ecologically-sound strategies for the agricultural sector, our survey has focussed on the perception of problems at the grassroots, and a different picture is revealed. Although

country people are brought up in an agricultural environment, there seems to be evidence that some farming activities are causing increasing levels of annoyance. One can forgive farmers for feeling persecuted; there is no doubt that most of them farm in a conscientious and careful manner. But there is clearly a minority who remain smelly, noisy and smoky neighbours, and there is often very little that local authorities can do to prevent their activities. There remains the problem of polarising views; farmers and the NFU defending their practices in one corner, and environmental protection agencies in the other. Much has been done to bring the two sides round the table in recent years — one Principle EHO reports that, in relation to stubble burning, “On an annual basis the Chief Environmental Health Officers meet the NFU and Fire Officers of the County and this has proved a useful forum and encouraged improvements”. There is clearly room for more co-operation of this sort.

Part 4 — Policy Development

In view of the survey results, three questions arise:

- 1. Is information provision adequate?** MAFF, through ADAS, does provide a large amount of advice to farmers on pollution prevention, including most of the areas identified as problems in the survey (noise is the exception). Under COPA, these form part of a Code of Good Agricultural Practice. However farmers must now pay for most ADAS advice and publications, and there can be little doubt that this inhibits the spread of knowledge and understanding. In the past HSE produced a pack of different information leaflets on farm safety for farmers; perhaps a similar pack about pollution could be distributed by MAFF — as a belated contribution to the EEC Year of the Environment! In addition, the various advice leaflets and booklets do come up for periodic revision, and we would ask that NSCA be consulted on particular aspects.
- 2. Is regulation adequate?** There may be a number of areas in which tougher regulation is required. For instance the RCEP 11th report (1985) recommended that all structures for the storage or control of slurry, silage and other farm wastes should be made subject to building regulations, and that capital grants for such developments should only be approved in consultation with regional Water Authorities. This concept could be expanded to agricultural buildings in respect of noise and odour, in consultation with local authorities' Planning and Environmental Health departments. Furthermore, where agricultural practice is concerned, is there a way of giving regulatory force to the agreed Code of Good Agricultural Practice?
- 3. Is enforcement adequate?** In many cases legal safeguards against agricultural pollution are already in place, yet there are clearly obstacles to proper enforcement. How can these be overcome?

The whole question of agricultural pollution is the subject of intense debate. This report is intended to provide a focus for informed discussion about the important issues. Copies of the report will be circulated to a number of interested organisations and individuals, and NSCA is keen to receive comments, particularly relating to the three questions identified above. Readers of Clean Air are invited to contribute their own views.

OBITUARIES

REAR ADMIRAL PHILIP GRAHAM SHARP, CB, DSC

It is with the deepest regret that we record the death of Philip Sharp peacefully in hospital on 10th February 1988 at the age of 74 years. Following a most distinguished career in the Royal Navy spanning over 30 years, he started his second career in air pollution control in 1968 when he was appointed Director, later Secretary General, of the National Society. He was a member of the Clean Air Council — a Statutory Body — from 1968 until its dissolution in 1979 and was Chairman of that Council's Steering Committee from 1974 to 1979. A Fellow of the Royal Society of Arts, and a Companion of the Institute of Chemical Engineers, his services to clean air were recognised by the City of London in 1978 when he was made a Freeman of the City. In parallel with his duties with the Society in 1978 he was appointed Director General of the International Union of Air Pollution Prevention Associations, a position which he held until his retirement in 1986 when he was elected Emeritus Director General and first Honorary Member of the Union. Travelling extensively throughout all five continents pressing the needs of air pollution control and promoting the work of IUAPPA, this work was recognised by the City of Paris in 1983 with the award of its Silver Medal, and in 1986 he was further honoured by the Clean Air Society of Australia and New Zealand with the award of its International Clean Air Award.

His commending presence, clarity of mind and singleness of purpose left nobody in doubt that Philip Sharp was used to making high level decisions and often in the most hazardous circumstances. In all his endeavours he brought with him a refreshingly salty tang and breath of good fellowship that was appreciated by all. A loving father, we offer our profound sympathies to his beloved wife Dilys and their son Douglas.

T. HENRY TURNER

Thomas Henry Turner who died on the 12th March, 1988 at the age of 93 was known to all as "T. Henry", a practice which originated as a way of differentiating him from an equally distinguished father who was also Thomas Turner.

In his immediate post graduate years T. Henry was in turn a Lecturer and a Consulting Engineer and later joined the former London North Eastern Railway. After Nationalisation in 1947 he became Head of Metallurgy for British Rail and in 1950 moved from Doncaster to Derby. By then T. Henry was already a staunch protagonist of Clean Air and had been Chairman of the Yorkshire Division of the (then) Smoke Abatement Society. He was a prime mover in the production of B.S. 1747: 1951 on Standard Grit Deposit gauges and wrote the forward to the first edition.

A glance at the lengthy list of T. Henry's academic and professional qualifications gives some indication of the span of his involvement but only personal acquaintance revealed the vigour with which he pursued matters, his monumental output of information, and the abiding interest which he somehow managed to take in so many aspects of life and, moreover, in so many people.

take in so many aspects of life and, moreover, in so many people.

T. Henry was a Department of Industry nominee on the Standing Conference of Co-operating Bodies from 1965-1979, when, at the age of 84, he stepped down for reasons of health. He was Chairman of the East Midlands Division in 1953/54, had been a Vice President of the Society and prized greatly the certificate awarding him Honorary Membership.

To have known T. Henry for over thirty years, with all his wisdom and learning and patience and courtesy and friendship has been a privilege and an experience to esteem, as others will also testify. His passing ends an era and leaves a gulf but we have only to look around to see immediate and striking testimony of what he worked for and achieved.

RONALD SHAPTER

It is with great regret that the Society has learnt of the passing of Ronald Shapter, an honorary member of the Society. He died suddenly just prior to Christmas while staying with his daughter in Scotland.

A native of Somerset, where he commenced his Local Government career at Bridgewater Borough Council. In 1938 he moved to High Wycombe where he stayed except for the war years when he served in the Royal Air Force. He retired on reorganisation in 1974 as Chief Public Health Inspector but retained his interest and enthusiasm for clean air work and was employed by South Oxfordshire District Council for a further period.

From the inception of the London, South East and Central Southern Division, Ron was a major figure and held the office of Chairman for sometime. He acquired a renowned expertise in wood waste boilers and problems of pollution from the wood working industries. His wise counsel and good humour will be missed in the clean air world in which he was so much respected. The Society extends its sympathy to Blanche, his wife, and their children.

STANLEY COHEN MEMORIAL DONATIONS

Donations of £250 were received in tribute to Stanley Cohen CBE, ex-President of NSCA, who died in October. The NSCA Council has directed that the donations be used to fund two posters which will accompany the NSCA teaching pack on noise pollution. This was seen as a way of making a lasting contribution to pollution education, in memory of one of the pioneers of Clean Air reform.

UPDATE

LANDFILL GAS PROBLEM RESURFACES

The results of an enquiry by Derbyshire County Council into a landfill gas explosion which destroyed a bungalow and injured three people in 1986 have been published. They coincide with another explosion linked with landfill gas emissions (this time in Kent), and with a sharp exchange between HMIP and the Association of Metropolitan Authorities on the subject.

The Derbyshire report pointed to a lack of communication between the various authorities responsible, and to the lack of official guidelines on landfill gas hazards from the DoE. In fact, HMIP wrote to local authorities just before Christmas asking them to survey all their landfill sites and to "ensure that their management and surveillance are of a high standard". HMIP considers that, of landfills receiving putrescible wastes, over 60% of those currently active and 75% of those closed in the last ten years are generating enough gas to warrant monitoring. They have asked the Authorities for details of landfill sites in their areas, and have promised to produce a Waste Management paper on landfill gas for summer 1988.

For their part, the AMA reacted abruptly to the circular. In a letter to the Secretary of State for the Environment, Cllr Fred Bramwell of the AMA Waste Management Group said that regular monitoring already takes place, but

imposes severe strains on staff. "Waste Disposal Authorities are already making every effort to ensure that emissions are dealt with safely. What we need are more resources and powers — not pontification", he said.

RCEP REPORTS ON BPEO

The Twelfth Report of the Royal Commission on Environmental Pollution — "Best Practicable Environmental Option" — was published in February. The concept of BPEO was introduced by RCEP in their 5th report in 1976. It specifies the pollution control technology which is the best practicable for the environment as a whole — taking air, water **and** land into account. The UK still lacks a coherent system of pollution control, with different legislation and regulatory authorities for different areas. The Commission welcomes the return of HMIP to the DoE as a step in the right direction, but concludes that the Inspectorate should have wider powers with which to carry through its remit to monitor and control pollution across all media. Worries are also expressed that HMIP should have adequate staff of the right calibre, and that the Inspectorate should be brought up to complement immediately. "Even that is barely adequate, and we hope HMIP will be expanded in due course", said RCEP Chairman Sir Jack Lewis at the report's launch.

Although the report makes no formal recommendations, it suggests that HMIP powers should be strengthened in a number of ways. Firstly, the concept of scheduled processes should be extended to permit the control of discharges to water and the handling and treatment of solid and liquid waste disposal to land.

Secondly, the range of processes which can be scheduled should be broadened to include those whose wastes pose the greatest potential threat to the environment or are technically the most difficult to control.

Finally, HMIP should be allowed to impose technology-based controls designed to achieve a BPEO for the specific process or waste. Concern is also expressed about the difficulty of resolving differences between different regulatory bodies over what constitutes a BPEO in a particular case.

It is the emphasis on doing what is best for the **environment** which distinguishes BPEO from the current concept of Best Practicable Means. The report states "... it may sometimes happen that for political or social reasons a practicable and environmentally acceptable scheme is overruled in favour of one which is much less acceptable from the pollution control standpoint When a decision of this kind is taken it is unacceptable to describe the outcome as a BPEO. The fact that environmental considerations have had to be compromised in this way should be openly acknowledged". In order to verify the decision-making process by which a BPEO is decided, the Commission introduces the concept of an "audit trail" — a record of the choices or decisions made at each stage, what the options were, and the basis for those decisions. The report suggests a set of procedures to ensure that all feasible options are assessed, and that decisions are made in a coherent and open fashion.

The United Kingdom Environmental Law Association (UKELA) pre-empted the RCEP report with its own — "Best Practicable Environmental Option — A

New Jerusalem?", published in December 1987. This anticipates many of the points raised in the RCEP before concluding that "the success or failure of BPEO both as an instrument of policy and an operational tool will ... depend upon the adequacy of the legal and institutional framework within which it operates". The report gives a detailed insight into legal aspects of pollution control. Incidentally, NSCA President Lord Nathan is also President of UKELA and a member of RCEP!

*Royal Commission on Environmental Pollution 12th Report: Best Practicable Environmental Option, HMSO 1988, £6.90

*United Kingdom Environmental Law Association: Best Practicable Environmental Option — a New Jerusalem?, UKELA 1987.

LEAD-FREE LAWSON — TOO LITTLE, TOO LATE?

The 5p differential between leaded and unleaded petrol, introduced in the Chancellor's March Budget, has met with a lukewarm response from environmental groups and industry. The Motor Agents' Association calculates that it will take the average motorist 18 months to recoup the cost of converting to unleaded fuel. Unleaded petrol is still only available from around 800 outlets, and sales account for just 0.1% of the UK total; much of this is bought by tourists from Europe. The Petroleum Industry Association argues that the tax advantage should be increased further — for comparison, the differential is 5p in Germany, 11p in Switzerland, 15p in Luxembourg, and 18p in Denmark. How many 'Clean Air' readers will be taking the plunge, and converting? We would like to hear of your experiences.

DIGEST OF ENVIRONMENTAL PROTECTION AND WATER STATISTICS NO. 10

The DoE has just published pollution data for 1986. Here are some of the main points of interest.

Sulphur Dioxide and Smoke United Kingdom sulphur dioxide emissions were estimated at 3.74 million tonnes in 1986, about 40 per cent down on the peak level of 6.09 million tonnes reached in 1970, and were on a level comparable to that of the early 1940s. 1986 emissions were 0.2 million tonnes higher than in 1985. The average urban sulphur dioxide concentration has fallen by about 70 per cent since 1965/66, although a limited number of localities remain in breach of EC smoke and sulphur dioxide limits. UK smoke emissions from coal combustion were estimated at 0.27 million tonnes in 1986, similar to levels since 1980 apart from a fall in 1984 due to the miners' dispute. Emissions of smoke fell by about 85 per cent between 1960 and 1980. The average urban smoke concentration in 1985/86 was about 50 per cent of what it was 10 years ago.

Nitrogen oxides, carbon monoxide and hydrocarbons Emissions of nitrogen oxides, carbon monoxide and hydrocarbons rose in 1986. Increases in emissions from power stations coupled with increases in emissions from road transport caused total nitrogen oxide emissions to rise to 1.94 thousand tonnes in 1986, from 1.84 in 1985. Carbon monoxide emissions rose by 15 per cent between 1976 and 1986 due to increases in road transport emissions. Hydrocarbon emissions rose by 9 per cent over the same period due to increases in emissions from road transport and from

gas leakage during transmission.

Lead Emissions of lead from petrol-engined vehicles fell by 10 per cent in 1985 and by a further 55 per cent in 1986 due to the reduction in the lead content of petrol at the end of 1985. Between 1973 and 1986 lead emissions from petrol-engined vehicles fell by 65 per cent from a peak of 8.4 thousand tonnes in 1973 to 2.9 thousand tonnes in 1986. This has occurred despite an increase in petrol consumption of 27 per cent and has been due to a reduction in the amount of lead in petrol from 0.84 grams per litre in 1972 to comply with the statutory limits of 0.40 grams per litre in January 1981 and 0.15 grams per litre in December 1985.

Acid rain Results for 1986 from the two new networks set up by the Department of the Environment show that the acidity of rainfall is highest in Yorkshire and Humberside and lowest in North West Scotland, Northern Ireland, West Wales and the South West of England. The amount of acidity deposited by rain is highest in areas of highest rainfall ie parts of Scotland, North Wales, Cumbria, the Pennines etc. Levels here are comparable with those in the sensitive areas of southern Norway.

Pollution incidents The number of pollution incidents reported by English water authorities in 1986 was 70 per cent higher than in 1980. There was a 7 per cent increase in England and Wales between 1985 and 1986. The main factors causing pollution incidents in 1986 were industrial causes, farm pollution and sewage and sewerage. About 1 per cent of reported pollution incidents resulted in prosecution.

Noise complaints The rate of complaints about noise from domestic premises has increased by a factor of nearly 8 between 1975 and 1985/86. Those relating to industrial and commercial premises and to road works, construction and demolition have nearly doubled over the same period.

Aircraft noise The population affected by aircraft noise at Heathrow has been reduced from about 2 million in 1976 to under 700,000 in 1986, despite a slight increase in the number of air transport movements. At Gatwick, air transport movements doubled between 1976 and 1986 and this was associated with increases in both the area and population affected. Since 1 January 1988 all aircraft using UK airports have been required to have a noise certificate and this should have a beneficial effect around all UK airports.

Forest health surveys Forest health surveys by the Forestry Commission carried out between 1984 and 1987 show that there has been a marked decrease in crown density over the period. It is unclear whether low density crowns are widespread in Great Britain as a result of a recent deterioration in condition or whether the recognition of reduced crown density has been improved.

CLEAN AIR FOR CANNOCK — CAN YOU HELP?

Many Local Authorities are congratulating themselves on completing their smoke control programmes but there are still some Councils which have only a small proportion of their district covered by Orders and fewer still which have not yet commenced a programme.

Cannock Chase District Council is pleased to announce its intention to commence domestic smoke control and has recently appointed Mrs. Karen Sulway, Environmental Health Officer, to prepare and implement a programme throughout the district.

The 1981 E.C. Directive on Sulphur Dioxide and Suspended Particulates included Cannock Chase district as an area in which concentrations of sulphur dioxide and smoke had exceeded the limits set and derogation was granted to the Council in order to comply with the requirements of the Directive by 1993.

In order for a more comprehensive assessment of smoke and sulphur dioxide levels to be made throughout the district, Cannock Chase D.C. is hoping to set up several eight-port monitoring stations and is looking to buy second-hand equipment. Anyone who can help in this respect should contact Karen on Cannock (0543) 462621 extension 597.

ENVIRONMENTAL PROTECTION TECHNOLOGY ADVISER APPOINTED

The DoE has announced the appointment of David Pounder as the Environmental Protection Technology (E.P.T.) Adviser. Mr. Pounder will be responsible for managing the E.P.T. scheme which will promote new methods of abating pollution, including the use of clean technologies.

The appointment will be for two years. Mr. Pounder is on secondment from ICI Chemicals and Polymers Ltd, where he has been New Business Leader (Environmental). He will be responsible for the operation of the E.P.T. Unit in the Department and will oversee the work of

the E.P.T. Group at Warren Spring Laboratory who are supporting DOE in the scheme.

The scheme will promote new methods of abating pollution, including use of clean technologies. It will identify the UK's industrial and environmental priorities for new pollution control technology both in terms of likely trends in pollution control standards and of what is technically and economically feasible, and encourage the development and application of these new technologies. Grant aid will be available for suitable projects in priority areas where it is judged encouragement and support for research and development will be most likely to yield results. The initial set of possible priority areas is being prepared and will be published shortly.

LEAD LEVELS IN LONDON'S SOIL

Lead contamination is now widespread in London's soil, according to a major new survey carried out by several London boroughs. Now Southwark Council, one of the twenty boroughs taking part in the survey, is to urge local residents not to grow certain foodstuffs on their allotments. Tests of 398 soil samples and nearly 1,000 fruits and vegetables from allotments throughout Greater London proved that all the land in the Inner London area was contaminated with lead. In some areas, the lead level was up to ten times the Government guideline. 3% of all food samples and 5% of lettuces, cabbages and blackberries were found to be unfit for consumption, containing up to seven times the accepted levels of lead.

The problems are thought to have been caused by industrial pollution, and an

accumulation lead fallout from traffic and paint over the centuries. Southwark's Environmental Health department is to produce a leaflet about the problem, and will write to the borough's 800 allotment-holders, urging them to think carefully about the kinds of foodstuffs they grow.

ACID RAIN SPEEDS UP PLANT EXTINCTIONS

Many of Britain's rarest and best-loved plants and flowers are under serious threat from acid rain according to research commissioned by Friends of the Earth. A new report, "**Cause for Concern**", highlights lichens, mosses, and insectivorous sundews as being particularly vulnerable.

The report makes it clear that whilst habitat destruction and land-use changes have been agreed to have had a massive impact on plants in Britain, effects linked to air pollution have been largely ignored. Many of the historical changes due to pollution are related to industrial development, high sulphur dioxide levels, and smoke. Britain's pollution climate is changing, however, and acidity of rainfall and high ozone and ammonia pollution levels are becoming increasingly important.

The report analyses in particular detail some species which are known from Dutch and Scandinavian research to be sensitive to air pollution. Amongst these are club mosses and sundews. The findings show that for these plants, large areas of suitable habitat remain in many of the counties where extinctions have occurred.

For instance, university researchers in the

Peak District have shown that 13 of the originally recorded 18 *Sphagnum* moss species are now extinct in the district, although extensive areas of peat moorland remain. It is thought to be virtually certain that air pollution damage is the cause.

Cause for Concern — An analysis of air pollution damage and natural habitats. A FoE Research Report written by Nigel Dudley (ERR) is available for £5.00 from FoE.

CHEMISTRY WEEK, 1988

The Royal Society of Chemistry (RSC) has designed the 17-24 October 1988 as Chemistry Week. Through its 35 Local Sections in the United Kingdom and the Republic of Ireland, the RSC will arrange activities designed to promote the public understanding of chemistry, and the role chemicals play in contributing to our quality of life. The RSC has over 30,000 members in the UK, in academia, industry, and government. Details of events may be obtained from the RSC External Relations Department, Burlington House, Piccadilly, London W1V 0BN.

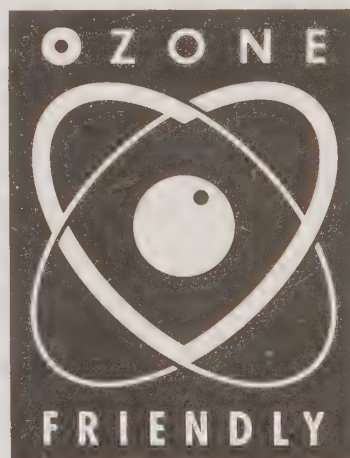
NEW BPM NOTES

A new version of BPM1 — "Best Practicable Means: General Principles and Practice" — has been issued by HMIP, replacing BPM 1/84. The notes contain an update on legal requirements and BPM assessment, and lists of schedule processes, noxious or offensive substances, BPM notes, and emission limits for schedule processes. Available from DoE Publications Sales Unit, Building 1, Victoria Road, South Ruislip, Middlesex HA4 0NZ. Tel: 01 841 3425.

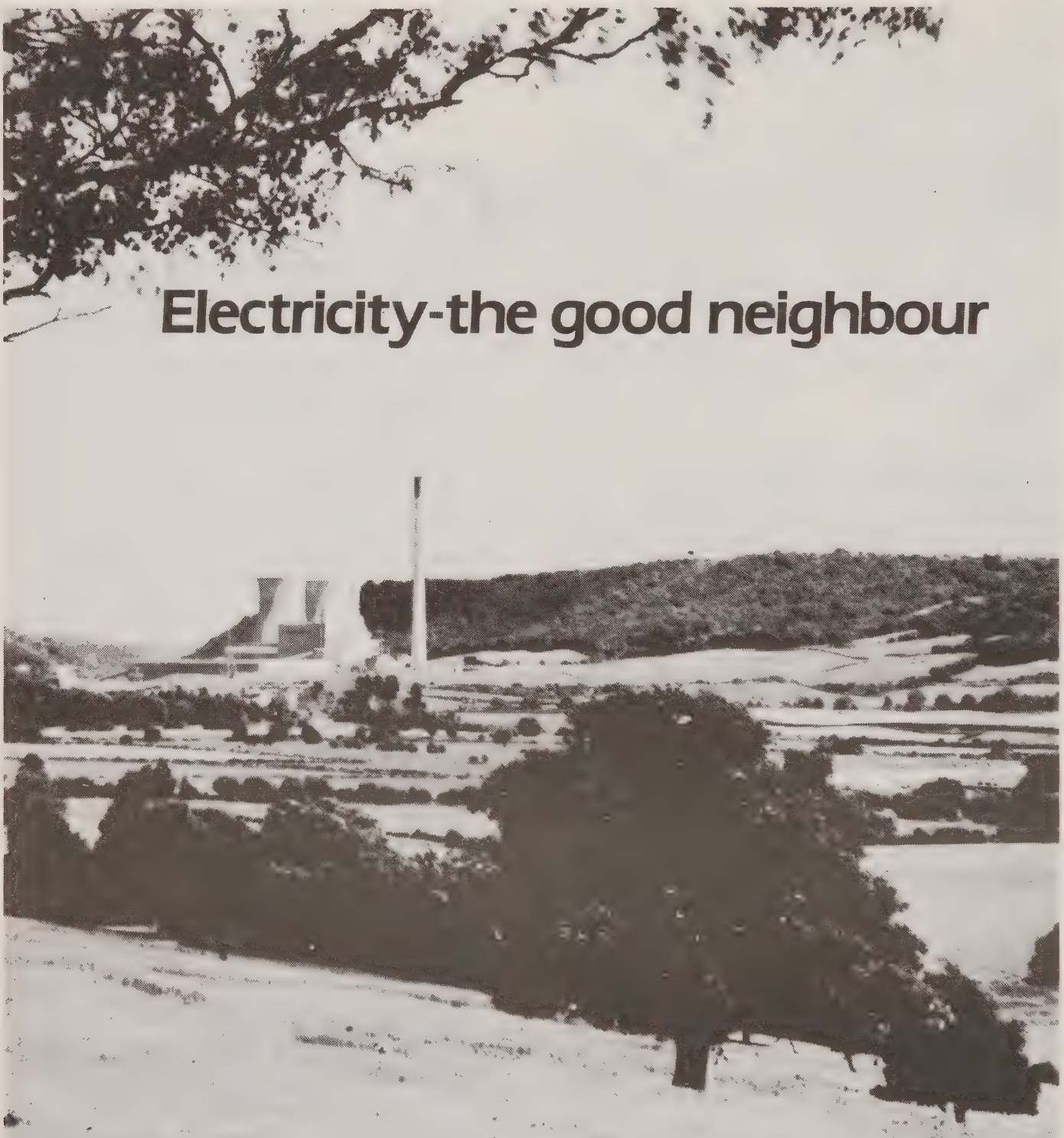
INDUSTRIAL NEWS

CFCs UNDER PRESSURE

The threat of increasing consumer resistance to aerosol cans containing chlorofluorocarbons has prompted eleven aerosol manufacturers to announce plans to abandon or phase out CFCs. The search is now on for substitutes. One route is to find formulations for CFCs which are less damaging to the ozone layer. Research by ICI into one possible compound — CFC-22 — has thrown up toxicology problems. Another option is to use hydrocarbon propellants, such as propane, but there are clearly safety worries, particularly for indoor use.



Pressure on the aerosol industry was enhanced by press reports that Prince Charles had banned all aerosols from his home. In fact, he may be exercising undue caution; many products are already available without CFC propellants, and some aerosol producers hope to cash in on public concern by labelling their products "ozone friendly". Meanwhile, attention will focus on the other major sources of CFCs — plastic packaging and refrigerants.



Electricity-the good neighbour

Power with preservation.

Modern living calls for lots of power. That means power stations and power lines.

But people care about the quality of life and of their landscape too. So does the CEGB. That is why, as a good neighbour, the Board has received more than 50 awards for keeping the lowest of profiles. By moulding its structures into the countryside.



Central Electricity Generating Board
Sudbury House, 15 Newgate Street, London EC1A 7AU

POLLUTION ABATEMENT AWARDS

Pollution abatement techniques won three of the six awards in the Better Environment Awards for Industry 1987 (BEAFI), awarded last month. The winners were Solvent Management Ltd, for a new system for cleaning paint spray guns; a joint award to Water Research Centre and Yorkshire Water for a new way of dealing with sewage sludge; and another joint award to Blue Circle Industries PLC and SIRA Ltd, for a computer based system called "Linkman". This saves fuel and cuts NOx pollution in cement kilns.

Meanwhile, one of last year's award-winners is to represent Britain in the European Better Environment Awards. Farm Gas Ltd has developed an anaerobic digestion plant for farms which turn cattle and poultry waste into valuable gas, liquid fertiliser and compost, while greatly reducing its pollution effect.

Reader Enquiry Service No. 8804

WORK STARTS ON CEGB WIND TURBINE IN KENT

Site work is to start in May for the construction of the largest wind turbine in England and Wales at Richborough power station in Kent. The 45 metre high, 1 MW machine, which at full output is capable of meeting the electricity demands of 1000 homes, is expected to be producing electricity for the local network in a year's time. The total project cost of £3.3 million is being shared by the Central Electricity Generating Board, Department of Energy, the European Commission and the manufacturers, James Howden of Glasgow.

Meanwhile, the CEGB has also made applications for planning approval for two 1,800 MW coal-fired power stations. The proposed stations are Fawley B on Southampton Water, and West Burton B in Nottinghamshire.

Reader Enquiry Service No. 8805

ASSOCIATION OF INDUSTRIAL FILTER AND SEPARATOR MANUFACTURERS — NEW TRADE ASSOCIATION

This Association has been brought about by the coming together of companies involved in the Gas Cleaning and in the Liquid/Solid Separation industries. The aims and objectives of the Association are the following:—

1. To promote the manufacture and sale of members' products, by the standardisation of terminology and definitions used in the industry;
2. To maintain and improve standards and to develop codes of practice in order to satisfy clients' requirements.

The initial membership comprises:—

A.A.F. Limited
 Allis Chalmers G.B. Limited
 Delfilt Limited
 Euro Technik (UK) Limited
 Hosokawa Mikropul Limited
 Joy Process Equipment Limited
 Lerner Limited
 Paxman Filtration
 Peabody Sturtevant Limited
 Stockdale Filtration Systems Limited
 R.O. Stokes & Company Limited

Further information can be obtained from the Secretaries, Messrs. Wenham Crane, 15 Took's Court, London EC4A 1LA. Telephone number: 01-831 7581.

Reader Enquiry Service No. 8806

OUTLOOK ROSY FOR POLLUTION CONTROL INDUSTRY

The pollution control sector is benefitting from an evolving awareness of environmental issues and associated problems. Good growth and better profitability for the industry should be seen over the coming years, but much could depend on the spending power of public authorities over this coming period, since they account for a large proportion of the industry's sales.

These are the main points to emerge from a new Business Ratio Report by city analysts ICC; "Pollution Control" 5th Edition. The Report analyses the financial performance of 61 leading companies in the industry over a three-year accounting period to March 1986. Sales rose by 10% over the three years covered, which for 53 companies represented an increase of £61m. to £670m. The best sales growth rates were enjoyed by companies in the Air and Gas Control Equipment sector, although the largest companies by turnover were those in the water pollution and sewage control sector. Biwater is the industry leader by turnover (£88.8m. in 1985/86), followed by Mono Pumps (£54.3m) and Aiton & Co. (£51.1m).

Profitability has improved over three years, up from 5.0% to 5.8%. The water pollution and sewage control sector enjoyed the best margins overall, but it has more lossmakers (6) than the air and gas control equipment sector (5). The number of lossmakers overall, however, has fallen over three years, from 16 to 11. Return on capital figures showed improvement, from 15.4% in 1983/84 to 19.5% in 1985/86, as did return on assets, up from 6.6% to 7.6%. Stock turnover

remained steady, but a cause for concern must be the industry's lengthening debt collection period — longer over three years by two weeks to 101 days, an exceptionally long period by most standards.

Overall, the pollution control industry should continue to do well. Greater spending on Research and Development will be necessary, though, if companies are to take advantage of the opportunities offered by technical developments in the pollution control field. This obviously implies a degree of business risk, but in general the future of the industry looks rosy.

REPORT: 'Pollution Control' — 5th Edition. Price: £155 from ICC Business Ratios, 28/42 Banner Street, London EC1Y 8QE.

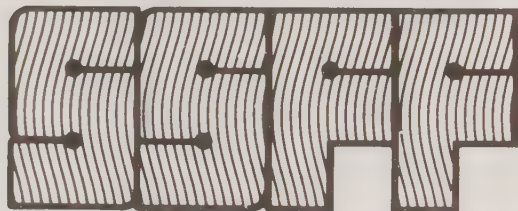
Reader Enquiry Service No. 8807

RECHEM ANNOUNCE NEW PLANS

Rechem International Ltd have announced plans to build an additional high temperature incinerator at the company's site in Fawley, Hants. Construction of the new facility will double the capacity of the Fawley plant from 20,000 to 40,000 tonnes a year. Building work will commence in six months and is scheduled for completion in mid 1989. Consent for the additional incinerator is permitted under the terms of Rechem's current planning consent.

Reader Enquiry Service No. 8808

SOLID SMOKELESS

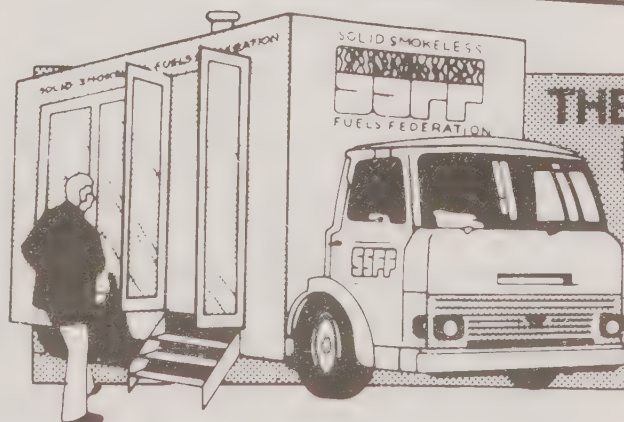
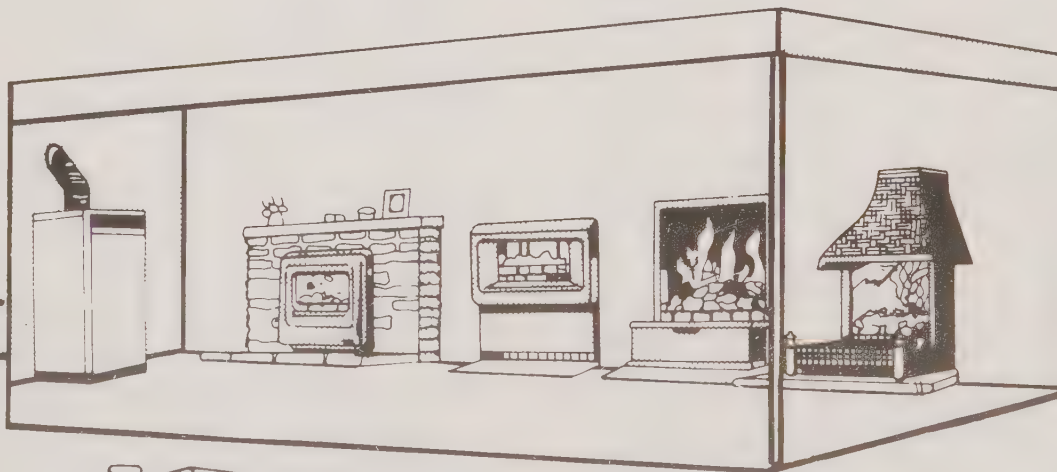


FUELS FEDERATION

The Solid Smokeless Fuels Federation is an independent advisory organisation promoting the interests of the Producers and Distributors of domestic Solid Smokeless Fuels.

The Federation's primary aim is to encourage and develop the use of Solid Smokeless Fuels for domestic heating.

Since the introduction of the 1956 Clean Air Act the Federation's work has been closely linked with Local Authorities encouraging the use of Authorised Solid Smokeless Fuels on approved appliances.



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EXHIBITION EQUIPMENT
ARE AVAILABLE TO
LOCAL AUTHORITIES
INTRODUCING SMOKE
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NSCA NEWS

RADIATION MONITORING SYMPOSIUM

NSCA has a reputation for organising informed discussion on matters of current concern, and the one-day symposium 'Radiation Monitoring — the Role of Local Authorities' was well timed. In the wake of the Chernobyl disaster many LAs feel the need for independent information about radiation hazards, and several are looking at collaborative monitoring schemes. The purpose of this event, organised jointly with London Scientific Services, was to give LA representatives an introduction to the technical requirements for monitoring, and to discuss the ways in which information may be shared and co-ordinated.

The scientific context was set by Dr Frances Fry of the NRPB in a talk on the nature and measurement of radiation. John Langston, Secretary General of NSCA, then outlined a proposal by the NSCA Civil Nuclear Power Working Group to establish an independent national radiation monitoring and information service. The Society is concerned that, in the event of a radiation incident, there should be access to information which was scientifically accurate, and was seen to be free of political influence.

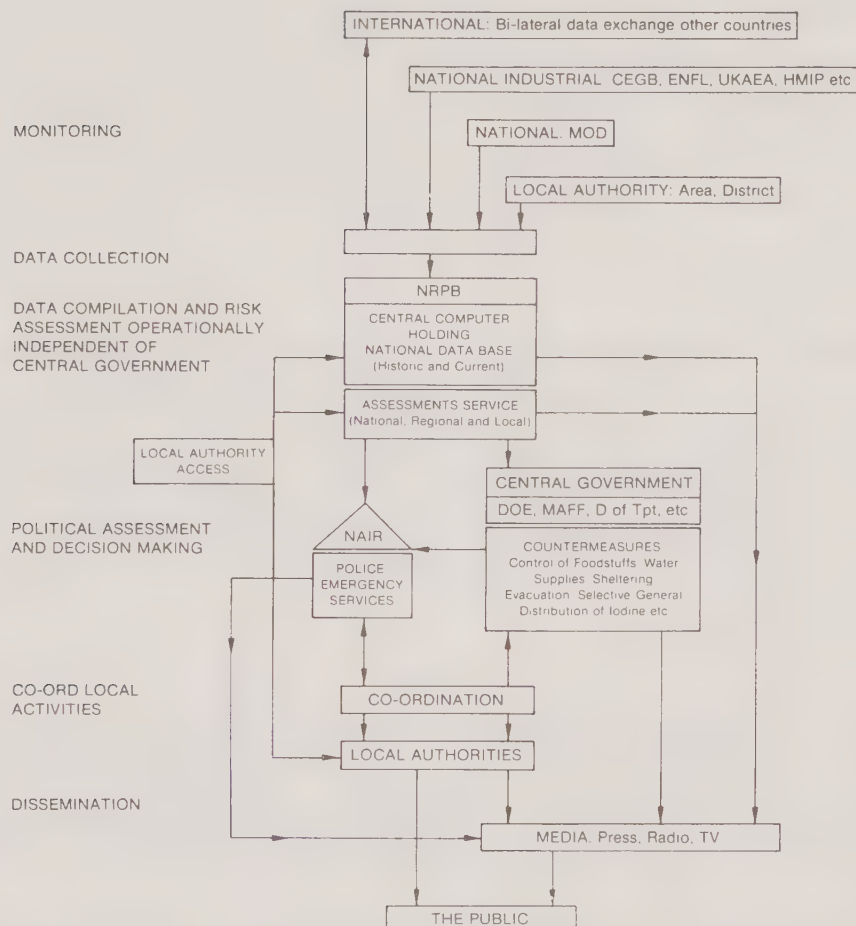
Dr Miles Parker outlined MAFF responsibilities for radiation monitoring, and explained how this was co-ordinated with local authorities. The DoE's RIMNET scheme (National Radioactive Incidents

Monitoring Network) was then presented by Dr Martin Jones. This session provoked some lively discussion, particularly in relation to the proposed mechanisms for information provision. Some LA delegates expressed doubts about the adequacy and technical competence of the information which the system would provide for them. Dr Jones said that the LA associations had been consulted on the matter, and that the DoE had not received a response. Despite a plea from Dr Mike Schwar of London Scientific Services that further consultation take place through NSCA, Dr Jones felt that the proposed system was adequate.

The afternoon session was devoted directly to LA matters. Mick Pullen of London Scientific Services described the involvement of LSS in London's Radiation Surveillance programme, showing some interesting data about historical radiation levels in the capital. The experience of Mr J P Goss, Principal EHO at Ealing, in measuring the passage of the Chernobyl plume across his borough reinforced the need for LAs to undertake independent monitoring. Exactly how data from LAs could be collated on a coherent basis was the subject of the final presentation by Dr Martin Courtice of Manchester City Council. The Association of Metropolitan Authorities is setting up a Radiation Collation Centre, independent of the RIMNET system, very much in line with NSCA proposals. Whatever the DoE plans, it seems clear that a parallel network of radiation monitoring, based on LAs, will soon be able to provide comparable data. This is particularly important since the DoE has now awarded the contract for the first phase of RIMNET without further consultation on its proposals.

NSCA CIVIL NUCLEAR POWER WORKING GROUP

DRAFT OUTLINE PROPOSAL

NATIONAL RADIATION MONITORING
AND
INFORMATION SERVICE

NSCA MARCH WORKSHOP

Entitled "Prevention rather than Cure — the Future for Industrial Air Pollution Control", this two-day workshop attracted a full house of delegates to Lincoln College Oxford. A high level of expertise in the presentations, and participation by delegates from industry, local authorities and specialists, combined to make this one of the most successful NSCA workshops yet. Chaired by NSCA President Lord Nathan, papers included — Overview of new/impending requirements and the enforcement agencies; Local Authority role in the preparation of guidelines/BPM notes; Interface between Industry and Environmental Concern;

EIA — a review of UK obligations and methodology; Control requirements for new and existing large combustion plant; Developments in particulate abatement technology; Hydrocarbons — control options for stationary and mobile sources; Emissions measuring; Ensuring cost effective compliance checking mechanisms; Legislation, enforcement and the role of the courts; Meeting a "No nuisance" provision; Public interest in information — registers and beyond; Planning for sustainable growth. Full proceedings of the workshop will be available from NSCA shortly, price £10.50, and should be regarded as essential reading for anyone involved in industrial air pollution control.

LONDON & SOUTH EAST DIVISION

Visits were made on 24 June 1987 to the Beaumont Steel Chimney Specialist Works at Mere in Wiltshire and on 23 September to British Gas Research Laboratories at Fulham. The Division is hoping to organise a panel of speakers who will be prepared to give talks on air pollution, and the activities on the NSCA. Chairperson Mrs Pat Naylor is continuing to make good progress after her recent illness — we wish her well and look forward to a speedy recovery. Mr Peter Hollingsworth, our representative on Central Southern Division, has resigned to take up the post of Southern Area Manager, Environmental Services Department, with Birmingham City Council in March 1988.

NORTHERN DIVISION

49 members attended the Division's Autumn Meeting in the Borough of South Tyneside. Mr F G McQueen, the Borough's Chief Environmental Services Officer, welcomed members, noting the success of the Borough's Smoke Control Programme, which is due for completion in 1990-91. Mr J Hann then gave a demonstration of the Ebac Electronaire, developed by his company for control of smoke, pollen and other indoor air pollutants. The meeting were most impressed with the demonstration.

EAST MIDLANDS DIVISION

We are sorry to report that Cllr W R Cashmore died suddenly on 2nd March 1988. Bill Cashmore worked for British Rail, and had represented Peterborough on the East Midlands Division since 1964, a good many of those years on the Divisional Council, and was Chairman of the Division in 1976/77. He was major of Peterborough in 1977.

At our Divisional Council meeting on 25th February Bill announced his intention of standing down from the Peterborough City Council and it is accordingly the more fitting that on that occasion the Chairman Cllr R S Chamberlain JP paid tribute to the service which Cllr Cashmore had given to the Society. He was much respected and brought a lively brand of humour to our proceedings.

YORKSHIRE & HUMBERSIDE DIVISION

A meeting of the Divisional Council was held at Drax Power Station, Selby, on the morning of 14th January 1988, and this was followed by lunch at the invitation of the C.E.G.B. The afternoon session, which was attended by over 30 members, heard a presentation given by the C.E.G.B. on the "Flue Gas Desulphurisation" and the efforts now being made in helping to combat acid rain. The chairman of the Division, Councillor M. Bramley, gave a report on his recent visit to Germany, which included a visit to an operational F.G.D. plant. He outlined the progress and problems encountered in the German operation, stating that the most noticeable difference was in size of generation plant used in Germany, being much smaller than that in this country.

After the presentation, a tour of the plant took place, at which time members were able

to appreciate the magnitude of the problem involved in installing an F.G.D. plant. The Division is appreciative of the hospitality and information provided by the C.E.G.B. during this visit.

On the 8th March 1988 a joint meeting was held at Rotherham between the NSCA, Yorkshire and Humberside Division, and YAHPAC. A very informative morning session was held, at which nearly 40 members of both organisations attended. Reports were given by Mr. E.S. Tomlinson, HM Industrial Air Pollution Inspectorate, on the government's review of clean air legislation and the slow progress being made. This was followed by Mr. M. Gittins, Leeds City Council, who reported on the proposals for Environmental Impact Analysis, the involvement in existing planning procedures and the effects on the populace, and areas covered by E.I.A.

The afternoon session involved a visit to a Rotherham steelworks, which is in the process of installing a new "Bloomcast" furnace, thereby producing steel more efficiently and economically than in the past. It is anticipated that this development will mean that the industry will be much more competitive in world markets. Members agreed that this was a very interesting and informative visit, and most members were surprised at the size of the furnaces and the quantities of materials handled in the steel making process.

SOUTH WEST DIVISION

On Wednesday 27 January 1988 over twenty members of the Division visited the Blue Circle Cement Works at Plymouth. An interesting tour of the premises was preceded by a video film of the cement making processes. A particularly interesting part of the process used on the site was the use of old tyres to partially fuel the kilns.

At the Divisional Council meeting in the morning a presentation was made to Howard Nowell, the recently retired Honorary Secretary of the Division. The Chairman of the Division, Hylton Dawson, presented Howard with a cheque on behalf of the Society and a framed picture of Concorde flying over South West England. Howard Nowell had been Secretary for eight years and has enjoyed the work and made many friends. He continues to be an active member of the Society representing the Division on the Conference and Promotions Committee and the Council of the Society.

Erratum: *In the last issue Jane Dunmore was referred to as 'Editor of Clean Air and Information and Press Officer', omitting reference to her position as the Deputy Secretary General, which she held from February to July 1987. We are pleased to rectify the omission.*



ENVIRONMENTAL HAZARDS TRAINING WORKSHOP
NSCA North West Division
MANCHESTER

Details from Geoff Kaufman: 061 344 3649

FUTURE EVENTS

6 MAY — Conference; Environmental Law

Organisers: UK Environmental Law Association

Venue: The Law Society, Chancery Lane, London

Details: Jill Elliott, Faculty of Law, Southampton University, SO9 5NH

9–11 MAY — Conference; Gasification Status and Prospects

Organisers: Institute of Energy

Venue: Crown Hotel, Harrogate

Details: IoE 01 580 0008

19 MAY — Symposium; Hazardous Substances, a European Update

Organisers: Royal Society of Chemistry

Venue: Manchester Polytechnic

Details: Mr. R.W. Hazell, RSC, Burlington House, London W1V 0BN

23 MAY — Meeting; New Sources and Problems in Urban Transportation Noise

Organisers: Institute of Acoustics

Venue: Society of Chemical Industry, Belgrave Sq, London

Details: IoA, 25 Chambers St, Edinburgh EH1 1HU

9 JUNE — Symposium; Environmental Hazards Training Workshop

Organisers: NSCA North Western Division

Venue: Creation Consolidation Expansion Centre, Manchester

Details: Geoff Kaufman, 061 344 3649

13–15 JUNE — Conference; Indoor and Ambient Air Quality

Organisers: Imperial College

Venue: Imperial College, London

Details: Prof R Perry, Imperial College, London SW7 2BU

15–16 JUNE — CONFERENCE; Clean Coal, Challenges & Technologies for the 21st Century

Organisers: Friends of the Earth

Venue: Sedgewick Centre, London E1

Details: FoE, 26 Underwood St, London N1

21–24 JUNE — Seminar; Waste Combustion International

Organisers: WARMER campaign

Venue: Churchill College Cambridge

Details: WARMER 0892 24626

27 JUNE – CONFERENCE; Building Soiling and Deterioration in Urban Areas

Organisers: Middlesex Polytechnic

Venue: Middlesex Polytechnic, London N11

Details: 01 804 8131 x 2514/2466

8 SEPT – Symposium; NO_x Generation and Control in Boiler and Furnace Plant

Organisers: Institute of Energy South Coast Branch/Combustion Institute

Venue: Crest Hotel, Southsea, Hants

Details: Dr J S Hardman, 0705 827681 x 224

20–21 SEPT – Exhibition; Furnaces '88

Organisers: Furnaces '88

Venue: Albany Hotel, Birmingham

Details: David Brown, 0737 768611

20-22 SEPT – Conference; Desulphurisation for Coal Processing Systems

Organisers: Institution of Chemical Engineers

Venue: Imperial College, London

Details: BOHS, 01 486 4860

24–27 OCT – 55th Clean Air Conference and Exhibition

Organisers: National Society for Clean Air

Venue: Canolfan Aberconwy, Llandudno

Details: NSCA, 0273 26313

28–29 NOV – Conference; Health and Environmental Consequences of Ozone Depletion

Organisers:

Venue: RIBA, Portland Place, London

Details: Dr R Russell Jones, St Johns Hospital for Disease of the Skin,

BOOK REVIEWS

ATMOSPHERIC POLLUTION

by Derek Elsom. *Publishers: Basil Blackwell, 1987. Price: £29.50 hardback and £9.95 paperback. ISBN: 0-631-13815-3 Hbk
0-631-15674-7 Pbk*

Chernobyl, acid rain, aerosols and the ozone hole, are no longer the exclusive concern of environmental specialists. Derek Elsom's comprehensive and up to date appraisal of atmospheric pollution provides an excellent, easily assimilated overview of the situation.

Examining the nature and sources of atmospheric pollution and its effects on the health of communities, crops, animals, buildings, materials, and climate, the author then discusses the possible methods for tackling the pollution problems.

Control strategies from around the world, including the USA, UK, Soviet Union and China, are analysed on a comparative basis: the effectiveness of approaches practised by capitalist and socialist states, developing and developed countries are explored. Ending with a review of international collaboration and an assessment of future prospects, pollution problems, such as acid rain, are seen as political rather than practical. Well interspersed with charts, tables and photos, this book provides a sound introduction to atmospheric pollution for the novice and specialist alike. Don't be deterred by the rather formal text-book design, however!

NOISE POLLUTION

by A. Lara Saenz and R.W.B. Stephens (editors) *Publishers: John Wiley & Sons Ltd. for SCOPE 1986. Price: £60.00. ISBN: 0-471-90325-6*

"Noise" has recently become a much vocalised problem. This book, however, veers away from the "noisier" issues and steers a steady course through the fundamental phenomena associated with the broad spectrum of noise pollution and control. Technically taxing, this is the first detailed reference source for researchers drawing attention to the wider implications of noise pollution; it concentrates on conceptual rather than mathematical aspects whilst maintaining maximum scientific precision.

Designed to appeal to specialists from a wide range of disciplines, this book is divided into three sections: fundamentals of noise and hearing, effects of noise on man, and sources of noise and its control; there are eighteen subjects, treated by international experts, grouped under these headings. Supported by the Scientific Committee on Problems of the Environment (SCOPE) and approved by the International Commission of Acoustics, this tome is of undoubted interest to the specialist but inaccessible to the layman.

ADVANCED COAL-USE TECHNOLOGY

by Walter C. Patterson. *Publishers: Financial Times Business Information 1987. Price: £180.00. ISBN: 1-85334-104-5*

Interest in coal as a source of fuel has been rekindled now that the protection of the environment has become a major political issue following the Chernobyl accident and consequent concern over the use of nuclear energy. Advances in coal-use technology have revolved around one key criterion: the need to control the side effects of using coal. This report explains how two important new technologies: fluidised bed combustion (FBC) and gasification have both proved commercially and environmentally viable. These innovations are making coal a cleaner, more convenient and more flexible energy source, and this study provides essential information on these developments.

Examining the three forms of FBC: bubbling-bed FBC, circulating-bed FBC and pressurised FBC, a description of how FBC can be used in boilers ranging from small

industrial to utility-scale, and how every variety of coal as well as waste can be burnt, is given. Gasification is now able to achieve outputs of hundreds of megawatts from single units whilst meeting environmental standards. Contact addresses for further information and advice are also provided. Concise, readable, and informative, this report is of value to all those involved or interested in advanced coal-use technology.

SICK BUILDING SYNDROME

An Intelligence Report for IBC, in conjunction with CWA by Ivan Vince.

Publishers: IBC Technical Services, 1987. Price: £95.00. ISBN 1-85271-026-8

This report, commissioned by IBC, is intended as a management guide to the causes of, and remedies for, the problem of Sick Building Syndrome which has been defined by the World Health Organisation as "general non-specific symptoms of malaise experienced by people during the time they are in buildings and which cease shortly afterwards".

People in most buildings, according to a recent survey in the UK, suffer from at least one of the following characteristics: lethargy, discomfort in nose and throat, headaches and eye irritation. Although this syndrome occurs most frequently in modern air conditioned buildings, older ones with natural ventilation are not exempt. Covering the symptoms, effects, solutions, views of both academic and commercial experts, and future avenues for research, this report will be of great interest to general and technical management, engineers, designers, and anyone involved in occupational health matters. It is clear, well-researched, compact and recommended.

A CASE FOR TRAFFIC RESTRAINT IN LONDON

by Stephen Plowden

Publishers: The London Centre for Transport Planning, Tress House, 3-7 Stamford Street, London SE1 9NT, Tel: 01-928 1440. Available directly from the publishers price £5.00 (plus 48 pence for p. and p.).

Outlining the problems entailed in curbing car traffic in London, this report compares methods and policies for achieving such restraint.

ECOLOGICAL AND ENVIRONMENTAL EDUCATION INITIATIVES IN BRITAIN

Monica Hale (editor)

Publishers: PNL Press 1987. Price: £5.50

ISBN: 0-946232-55-5

A unique directory offering for the first time, detailed, easily accessible, up to date information on environmental projects in the UK.

NATIONAL STRATEGIES AND POLICIES FOR AIR POLLUTION ABATEMENT

Publishers: United Nations New York, 1987

Price: US\$ 18.00 ISBN: 92-1-116404-4

Reports the results of the 1986 major review of national strategies and policies for air pollution abatement in 31 countries, prepared within the framework of the "Convention on Long-Range Transboundary Air Pollution".

A WORLD BEYOND HEALING: THE PROLOGUE AND AFTERMATH OF NUCLEAR WAR

by **Nicholas Wade**. *Publishers: Sidgwick & Jackson, London, 1987*
ISBN: 0-283-99537-8. Price: £12.95

The environmental effects of nuclear war, the likely casualties from a major exchange, and the prospects for the survivors are all themes in this impartial discussion of the far reaching impacts of nuclear war.

Swiftly dispelling the myths that firstly, rational leaders will never let a nuclear war begin and secondly, if they do, everyone will die, the author continues to address the problems of the outcome of nuclear war: nuclear winter, the psychology of leaders during crisis, the vulnerability of communications in relation to the control of nuclear weapons, the effect on the ozone layer, superfires ignited by the thermal pulse of nuclear explosions, the electromagnetic pulse and its ability to damage electrical equipment over vast areas, and the general mayhem which would ensue in the wake of nuclear devastation.

Dramatic, sobering, this book offers detailed, unbiased answers to all those questions unanswered by the military, or swept aside by the politicians in a tide of policy-making where the belief that "ignorance is bliss" prevails.

AIR QUALITY GUIDELINES FOR EUROPE

Copenhagen, WHO Regional Office for Europe, 1987
(WHO Regional Publications, European Series, No. 23)
Price: Sw.fr.60.- ISBN: 92-890-1114-9

Provides vital information intended to help the countries of the European Region develop standards that, if properly implemented, will protect public health.

CHERNOBYL: HEALTH HAZARDS FROM RADIOCAESIUM

Copenhagen, WHO Regional Office for Europe, 1987, Environmental Health No. 24.

The result of a Special Project established in the wake of Chernobyl, this study looks into contingency plans and emergency responses to such accidents, as well as the available monitoring and epidemiological capability.

NUCLEAR ACCIDENTS AND EPIDEMIOLOGY

Copenhagen, WHO Regional Office for Europe, 1987, Environmental Health No. 25.

Also following the Chernobyl accident, this report examines subsequent epidemiological developments.

INCINERATING HAZARDOUS WASTES

edited by **Harry M. Freeman**

Publishers: Technomic Publishing AG, 1987. Price: Sw.fr. 98.—
ISBN: 87762-535-2

Offering forty-five up to date reports on available thermal process technology, this book also provides practical management and engineering details on processes, procedures, equipment and new developments in this field.

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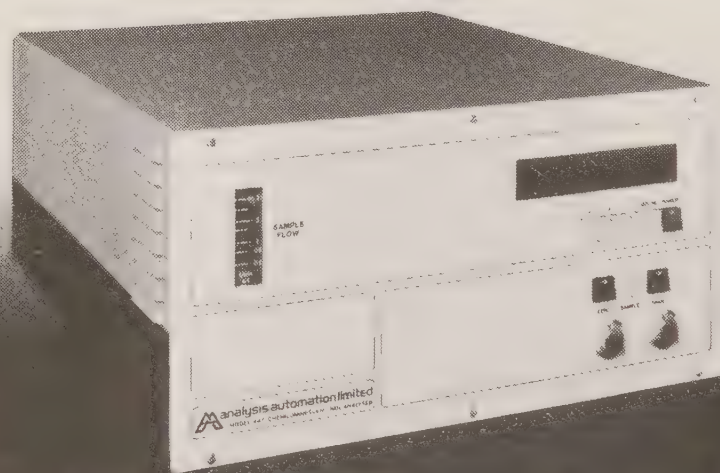


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19 Oxgate Gardens, Brent, London NW2 6EA

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28 Maes-y-celyn, Griffithstown, Pontypool, Gwent

EDITORIAL

GREENHOUSE ISSUE HEATS UP

Times PR

“It is time to stop waffling and say that the Greenhouse Effect is here.” So said a NASA climatologist, giving evidence to the US Congress recently. If acid rain was the air pollution issue of the 1980s (and it remains no less a problem for the future than in the past), global warming due to CO₂ and other trace gases seems certain to become the major debate of the 1990s. Specialists are discussing climatic modelling, the importance of different trace gases, and the relative contributions of various human activities, but the sheer scale of the problem is daunting.

We are all implicated; industry, agriculture, energy use in both developed and developing countries are all factors, compounded by an ever-growing, over-consuming world population. The need for environmental strategies which can achieve sustainable development, emphasised last year by the World Commission on Environment and Development in the “Brundtland” Report, is once more reinforced. An important first step in recognising the seriousness of the situation was taken in June. At the Toronto Conference on the Changing Atmosphere, representatives from 48 countries agreed to urge industrialised nations to reduce CO₂ emissions by 20% before 2005.

Here is an example of a truly global pollution problem. No single country can take action and hope to make a significant impact; what is required is concerted international effort. Where agreement is reached, this must be translated into action by regional, national and local government. As a national pressure group, NSCA plays its part in world affairs through the International Union of Air Pollution Prevention Associations, IUAPPA. At next year’s World Clean Air Congress IUAPPA will press for the development of policy options which can be implemented effectively — and quickly. As another scientist put it — “We are confident the Greenhouse Effect is going to happen and the longer we put off doing anything, the more drastic the remedy will have to be.”



55th CONFERENCE **LLANDUDNO** **1988**

ENERGY AND THE FUTURE ENVIRONMENT
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REPORTS

TWO LONG TERM AIR POLLUTION SURVEYS AROUND POWER STATIONS

by

A Martin and F R Barber

CENTRAL ELECTRICITY GENERATING BOARD
OPERATIONAL ENGINEERING DIVISION
MIDLANDS AREA
SCIENTIFIC AND TECHNICAL BRANCH

1. INTRODUCTION

Regular measurements of air pollution in and around towns have been carried out by local public health departments since the early years of this century. The methods used and the issuing of results were coordinated first by a Committee of Investigation in 1912. From about 1925, this coordination and reporting passed to the government Department of Scientific and Industrial Research. Over the years, the Department changed its name and location; it is now the Department of Trade and Industry, Warren Spring Laboratory (WSL), at Stevenage.

Corresponding measurements around many power stations have been carried out since the electricity industry was nationalised in 1948. The components measured are dustfall, smoke and sulphur dioxide in the air, using British Standard methods. The latest version available is to BSI (1969). These instruments and methods give results over periods of one day for gases and one month for dustfall which are known in the CEGB as 'routine surveys'. Measurements of this type are made at a number of sites around a single power station or a geographically close group of power stations.

The monthly average CEGB 'routine' results have been included in the Tables of Results issued by WSL. Some scientific papers on the results have been published, e.g. Jarvis and Austin (1957); England et al (1975); Stone and Clarke (1963); Clarke and Spurr (1976); Jarman and de Turville (1976); Powell and Tatchell (1976); Barber and Martin (1976); Dolman and Owens (1976); Dale (1976). More sophisticated instruments for shorter-term

measurements of sulphur dioxide were developed from 1956, and results from these published e.g. Cummings and Redfearn (1959); Martin and Barber (1966); (1967); (1973). Even more sophisticated analysers for short term values of sulphur dioxide, oxides of nitrogen and ozone were used from the 1970's, and results from these published e.g. Martin and Barber (1981) and (1984).

The CEEB has a statutory duty to generate with 'due regard' for the environment. The UK has to comply with EEC regulations in meeting certain levels of daily and yearly smoke and sulphur dioxide in ambient air (progress discussed in Dunmore, 1985). Smoke values are not discussed in detail in this paper. Most smoke derives from domestic sources with virtually none from power stations (Department of the Environment, 1986). Whilst we measure smoke (on the filter of the sulphur dioxide instrument) and report it to WSL and to Local Authorities, we are not usually called to comment on it.

Many of the 'routine surveys' around power stations, which used the British Standard daily/monthly instruments, have now been terminated, to be replaced by periodic investigations using the more sophisticated instruments, which are capable of giving hourly values for gases. By March 1985 (the date of the latest WSL Table of Results for sulphur dioxide), five CEEB routine surveys for sulphur dioxide were still being reported, those around Cottam, Didcot, Ince, Pembroke and Ratcliffe, together with three SSEB ones, around Cockenzie, Inverkip and Kincardine (WSL stopped publishing their Tables of Results for dustfall in 1982).

In the Midlands Area, 'routine surveys' are carried out around Ratcliffe and a group of 3 adjacent power stations — High Marnham, Cottam and West Burton. For convenience, the short title of the "Cottam" survey is used for that group. The results are issued monthly to the stations and the relevant Local Authorities and HM Industrial Air Pollution Inspectorate. They are also widely used in environmental presentations especially as they cover 20 years of measurements, and they are complementary to the results from Midlands Area 'acid rain' research, usually carried out at greater distances from power stations (e.g. Martin and Barber, 1984).

2. RATCLIFFE SURVEY

This was started in 1966, using 6 sites for dustfall and 11 sites for sulphur dioxide and smoke. The sites were set up around the zone where the maximum effect of the station was expected; around 3 km out for dustfall and 8 km out for sulphur dioxide gas. Seven of the sites for sulphur dioxide were closed down in 1973, as pollutant levels were falling. The present 6 sites for dustfall and 4 sites for sulphur dioxide are shown in Figure 1.

The long-term patterns of sulphur dioxide, total dustfall and the rate of fall of power station ash, averaged over all sites on a seasonal basis, are shown in Figure 2. This is what is usually shown to interested individuals or groups of people. On a few occasions, local interest leads to the display of results from individual sites, sometimes over individual days or months or years.

Taking sulphur dioxide first, Figure 2 shows that peaks have occurred in most winters. There have been gradual changes, through peak concentrations again in the very cold winter of 1981-2, and a recent decline to the lowest values ever recorded in Summer 1986. These results are not related to the output from the 2000 MW power station, which rose steadily from 1968 to 1975 and has remained virtually steady since. Instead the results reflect two factors — the emissions from low level sources, generally declining into the mid 1970's (DOE, 1978) — and the dispersing ability of the atmosphere, generally worse on cold, stagnant, foggy winter days, but also poor on some still summer evenings and nights (Martin and Barber, 1966; Martin, 1974).

These conclusions are supported by research studies in rural north Nottinghamshire using the continuous recorders for gases in the air. Linking concentrations with wind directions showed that the local power station contribution to the local sulphur dioxide was mostly less than 10% of the total over a year, with larger contributions from the surrounding towns (Martin and Barber, 1973). All distant power stations (and towns) will of course, add something to the 'background' level of sulphur dioxide.

As mentioned, the sulphur dioxide values in Figure 2 showed peak values around Winter 1968-9 and again around Winter 1981. This pattern is thought to be related to long-term weather changes. The incidence of persistent temperature inversions, usually accompanied by winter fogs, has shown similar long-term variations (around decades) in the UK in the past (Lawrence, 1966). When fogs occur, in light winds, relatively large concentrations of sulphur dioxide (and smoke) are found, because of the inhibited dispersion of pollutants from low-level sources in such stable atmospheric conditions. Present day fogs (post 1965) are less frequent and less persistent and contain less pollutants than those of the past (see Martin, 1974).

To put the present sulphur dioxide levels in the air in perspective, Figure 3 shows winter results in and around towns in the polluted 1940's to 1960's, before the London and other smogs (smog = smoke plus fog) led to the 1956 Clean Air Act and its implementation. The situation in towns has clearly improved markedly. None of the Figure 3 sites are still in operation, and comparatively few sites anywhere have been in operation for longer than a decade.

Returning to Figure 2, for total dustfall, then over the years the results have shown peaks in most summers. This is because most — around 90% — of the dust caught in the deposit gauges is not from the power station, but is soil particles and road dust, together with fragments of part-burned coal from local houses. More dust is blown by the wind from fields and roads in drier conditions, usually in summers. In the 1980's, more fields have been planted in the Autumn than in Spring, and this is reflected in our results.

Every deposit gauge sample is examined under the microscope, and the proportion of the distinctive tiny fused ash cenospheres from the power station are estimated. The cenospheres are found to be normally in the range 5 to 15% of the total dustfall collected, the major component being soil particles. Photomicrographs of deposit gauge material and power station cenospheres are shown in Figure 4. More comprehensive photomicrographs were given in a CEEB monograph, (Hamilton and Jarvis, 1962).

Before Ratcliffe became operational, some cenospheres were found, deriving from other nearby power stations. The cenosphere-fall only increased marginally while the various units at Ratcliffe were commissioned. By 1975, the power station reached its maximum sustained output, and the cenosphere-fall reached its present small and little-varying level. It does not increase in Winter, when the station is at its maximum, and does not change in step with the total dustfall, most of which is soil. Superficially, the tiny ash particles from the power station might be expected to disperse somewhat like the waste gases from the power station, but instruments for studying short-term variations in dustfall do not seem to be available.

3. COTTAM AREA SURVEY

This was started in 1966, using 12 sites for dustfall and 20 sites for sulphur dioxide and smoke. The sites were set up in the area around three power stations, one working and two under construction. High Marnham (1000 MW) used significant fuel from 1960; Cottam (2000 MW), some 8 km further north, from 1969; West Burton (2000 MW), some 7 km further north, from 1967. Twelve of the sites for sulphur dioxide were closed down between 1974-6, as pollutant levels were falling. Two others were closed in 1980 and 1982, because of landowners requirements. The present 12 sites for dustfall and 6 sites for sulphur dioxide are shown on Figure 5.

The long-term patterns of the pollutants, averaged over all sites on a seasonal basis, are shown in Figure 6.

For sulphur dioxide, over the years the levels have been less in this rural area than in that around Ratcliffe, which is fringed more closely by towns (see Figures 1 & 2). The peak concentrations in the Cottam area were in Winter

1969-70, one year later than in the area around Ratcliffe. The Cottam area concentrations passed through a minimum in Summer 1975 (the same as around Ratcliffe), rose again in the very cold winter of 1981-2 (as around Ratcliffe), and declined to the lowest ever recorded last summer (as around Ratcliffe).

However, an unusual peak in sulphur dioxide levels can be seen on Figure 6 for Summer 1970. This was not seen around Ratcliffe, but was seen in many other site results listed by WSL, especially in Eastern England, including London, and especially during June 1970. That month (in the East), the weather was hot and sunny. There were generally low wind speeds and many night-time temperature inversions, which serve to trap pollution emitted by low-level sources, so that it does not disperse normally (see Martin and Barber, 1966; 1967; 1973).

For total dustfall, over the years the levels in the Cottam area (Figure 6) have been quite similar to those in the Ratcliffe Area (Figure 2), except for two notable exceptions. There was clearly less total dustfall caught in the Cottam area compared with the Ratcliffe area in Summer 1967 and much more in Summer 1970. Figure 6 shows that the rate of cenosphere fall from power stations was not unusual in either of those summers. The peak in total dustfall in Summer 1970 was due to soil particles, as shown by our microscopic analysis. North Nottinghamshire is known for having a light sandy soil that tends to blow about if the fields have no established crops and if dry and windy weather occurs at that time. Also, during the early years of our survey we observed several farmers removing hedges to make larger fields. In the event, the spring months of 1967 (and 1968) in that area were wet and cool, but those of 1970 were warmer and drier and also more windy, and this is when the large dustfall occurred. Post-1970, the total dustfall values show a decline, clearer in the 1980's (like those around Ratcliffe), and we believe that the tendency towards planting fields in the Autumn rather than in the Spring is the reason for that.

As at Ratcliffe, the average cenosphere fall contributions to total dustfall is small — very small prior to 1970 (cf Ratcliffe prior to 1975) when comparatively little coal was used at the stations except at High Marnham. The cenosphere results in the 1980's are quite similar in the Cottam and the Ratcliffe areas.

4. CONCLUSIONS

“Routine” survey measurements of air pollutants around power stations are made with British Standard instruments, which yield daily values of sulphur dioxide and monthly values of dustfall. They have provided results which

are used to demonstrate the relatively small impact of power stations on their local environment over periods from days to decades.

In recent years, many of the "routine" surveys have been replaced or in some cases supplemented by ad-hoc investigations using more sophisticated instrumentation, capable of giving hourly values for gases. However, two "routine" surveys (those around Ratcliffe and around the Cottam area) have been in use for over 20 years, and these have given useful seasonal trend patterns. In the case of sulphur dioxide measurements, these have shown generally decreasing concentrations as emissions from low level sources have decreased. A period of increased concentrations around 1981 is thought related to long-term variations in weather factors like fogs, which can effect the dispersing capability of the atmosphere. In the case of dustfall, the material caught has been shown to be mostly soil particles. Temporary increases have been seen at times of strong winds before crops have been established. Recent changes in farming practices, planting in Autumn rather than Spring, is thought to be responsible for the decline in total dustfall since about 1980.

The microscopic assessment of the tiny distinctive fused ash spheres from power stations allows the power station contribution to total dustfall to be quantified, (it is usually around 10-15% of the total) and this is carried out as a routine on every sample in these two surveys.

5. ACKNOWLEDGEMENTS

The invaluable, careful and reliable assistance of the various team members over the years is gratefully acknowledged. The two team members still working on these surveys are N A Liptrot and M Wilson. Past team members include L Allwood, T J Oakland, C Smith and S L Wade.

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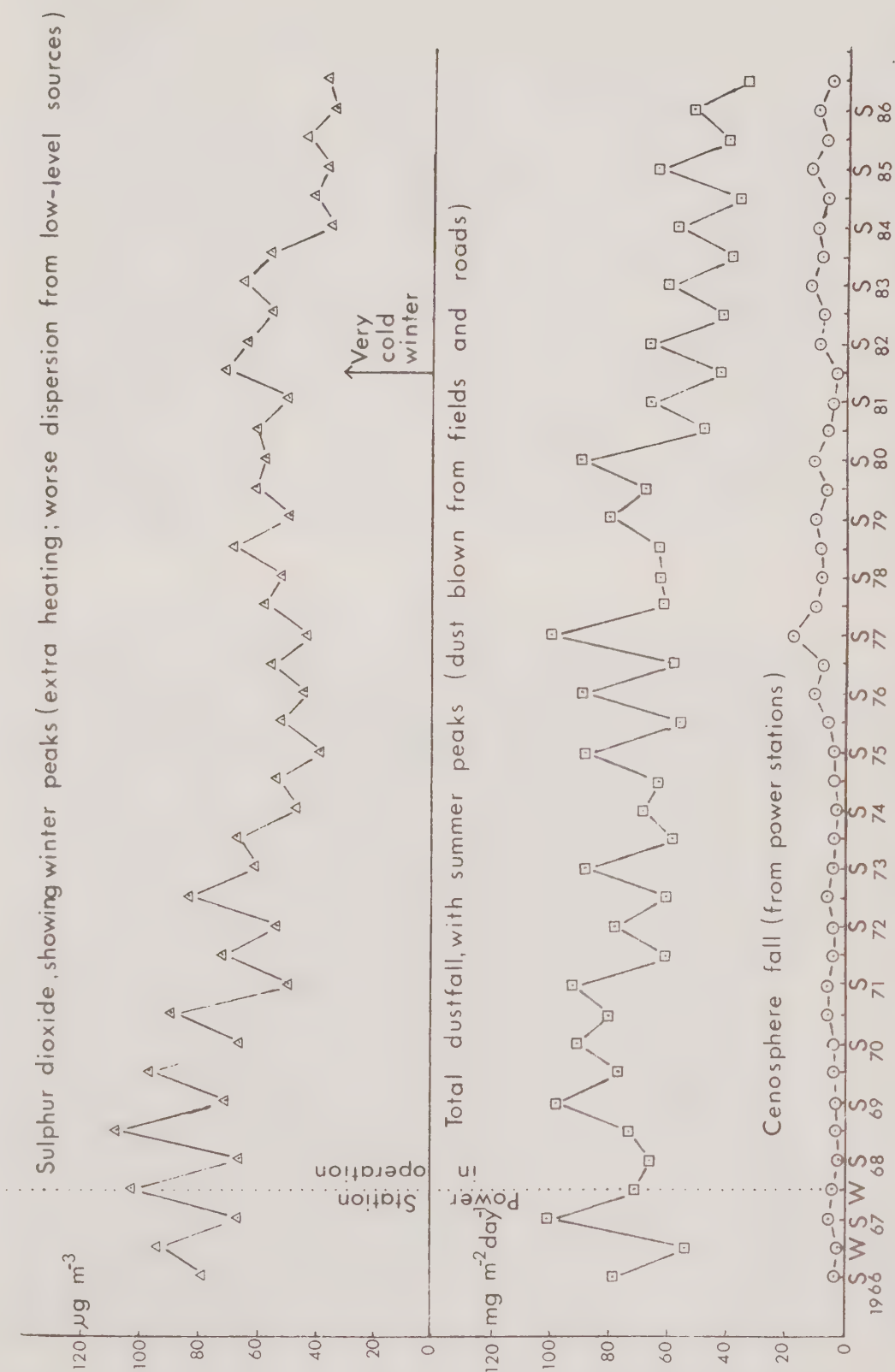
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Seasonal levels of sulphur dioxide, total dustfall, and cenosphere fall around Ratcliffe
(S = April to September, W = October to March)

FIGURE
No. 2

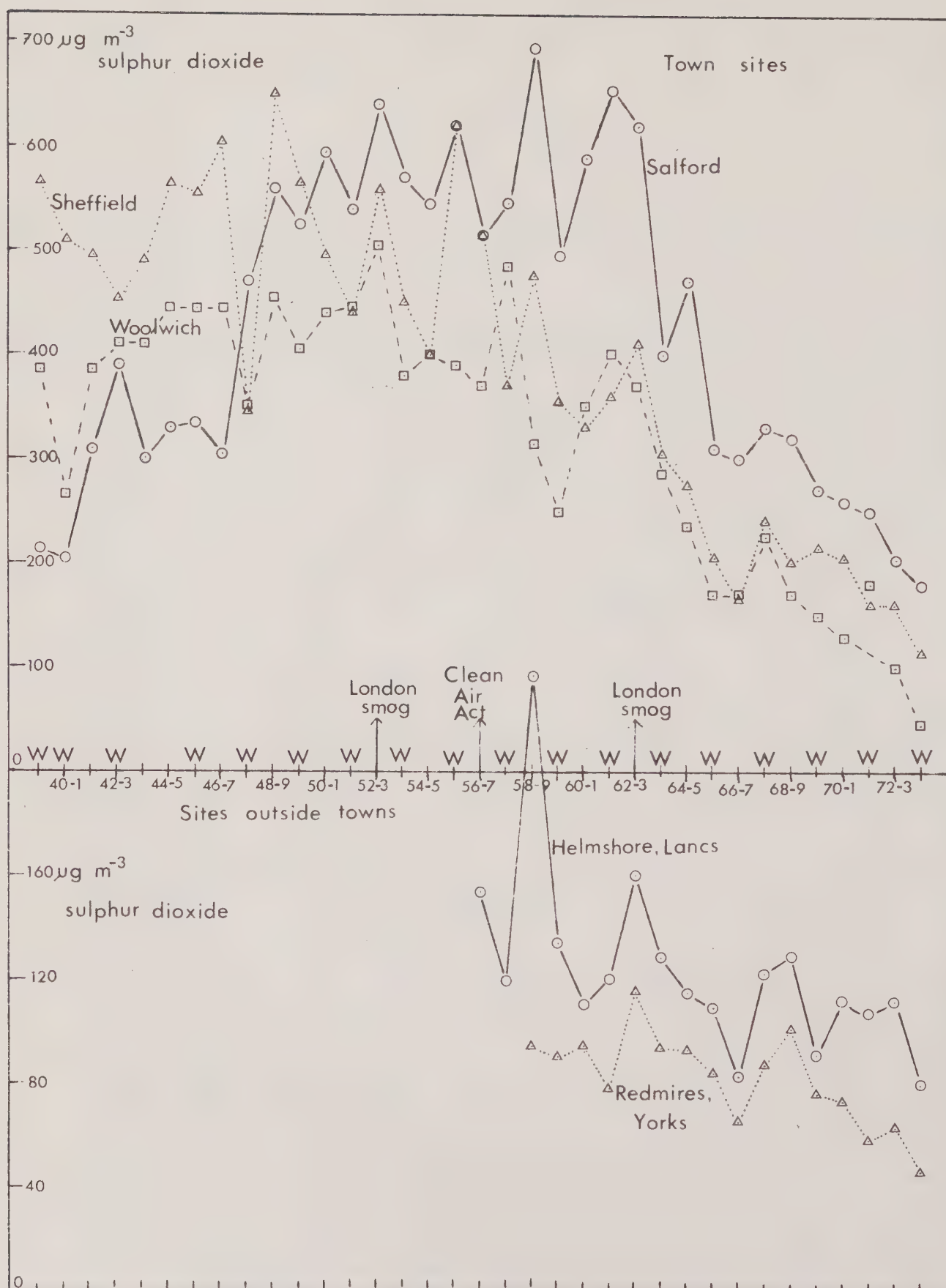


FIGURE No. 3 Sulphur dioxide concentrations in past winters

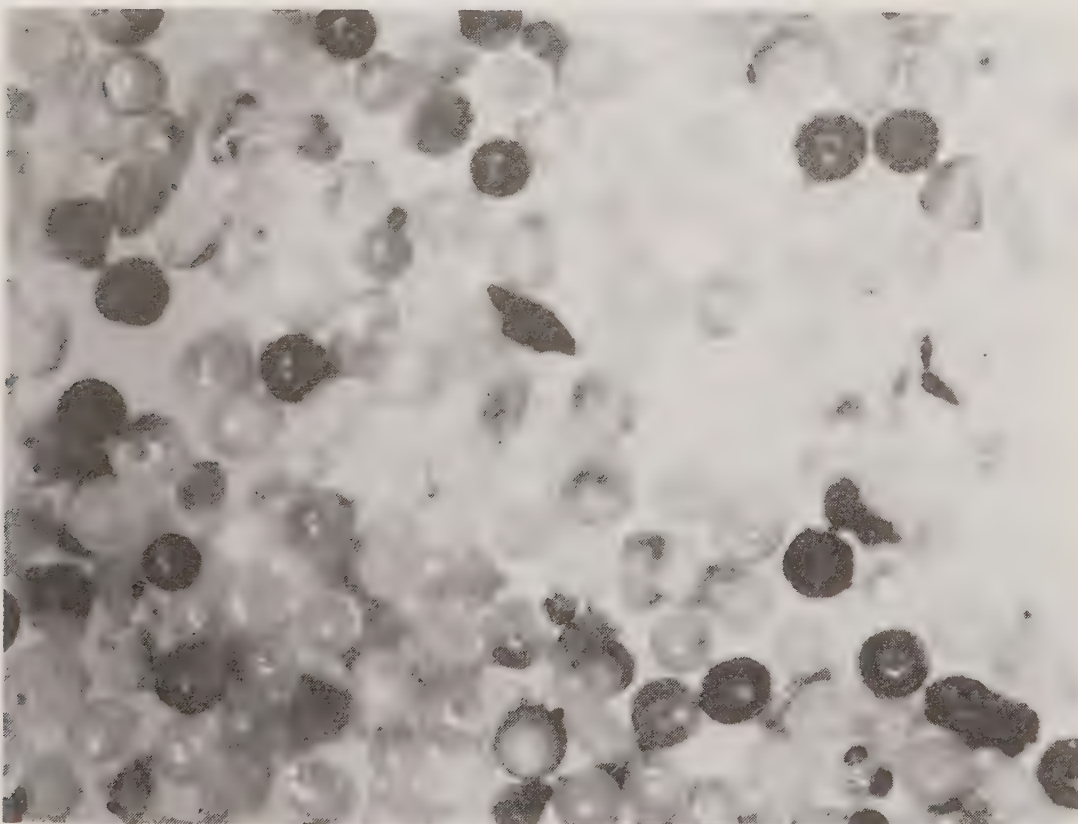
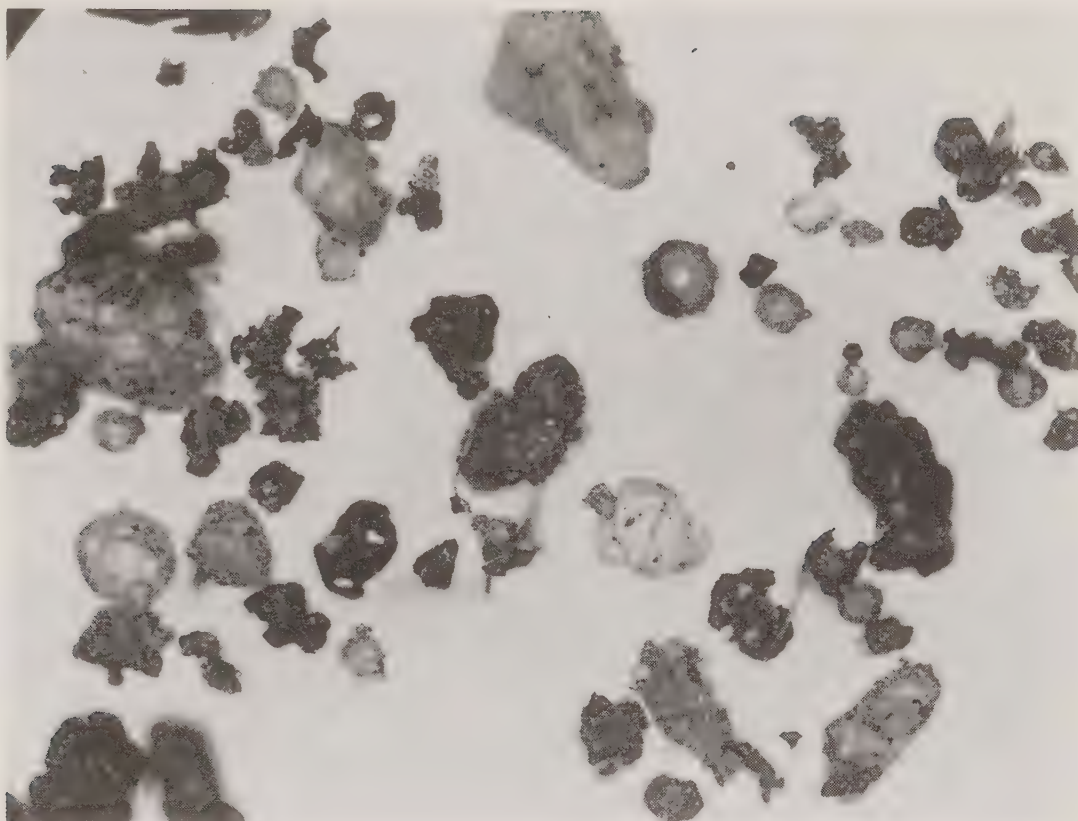


FIGURE
No. 4

Above- Deposit gauge contents under the microscope

Below- Power station cenospheres under the microscope

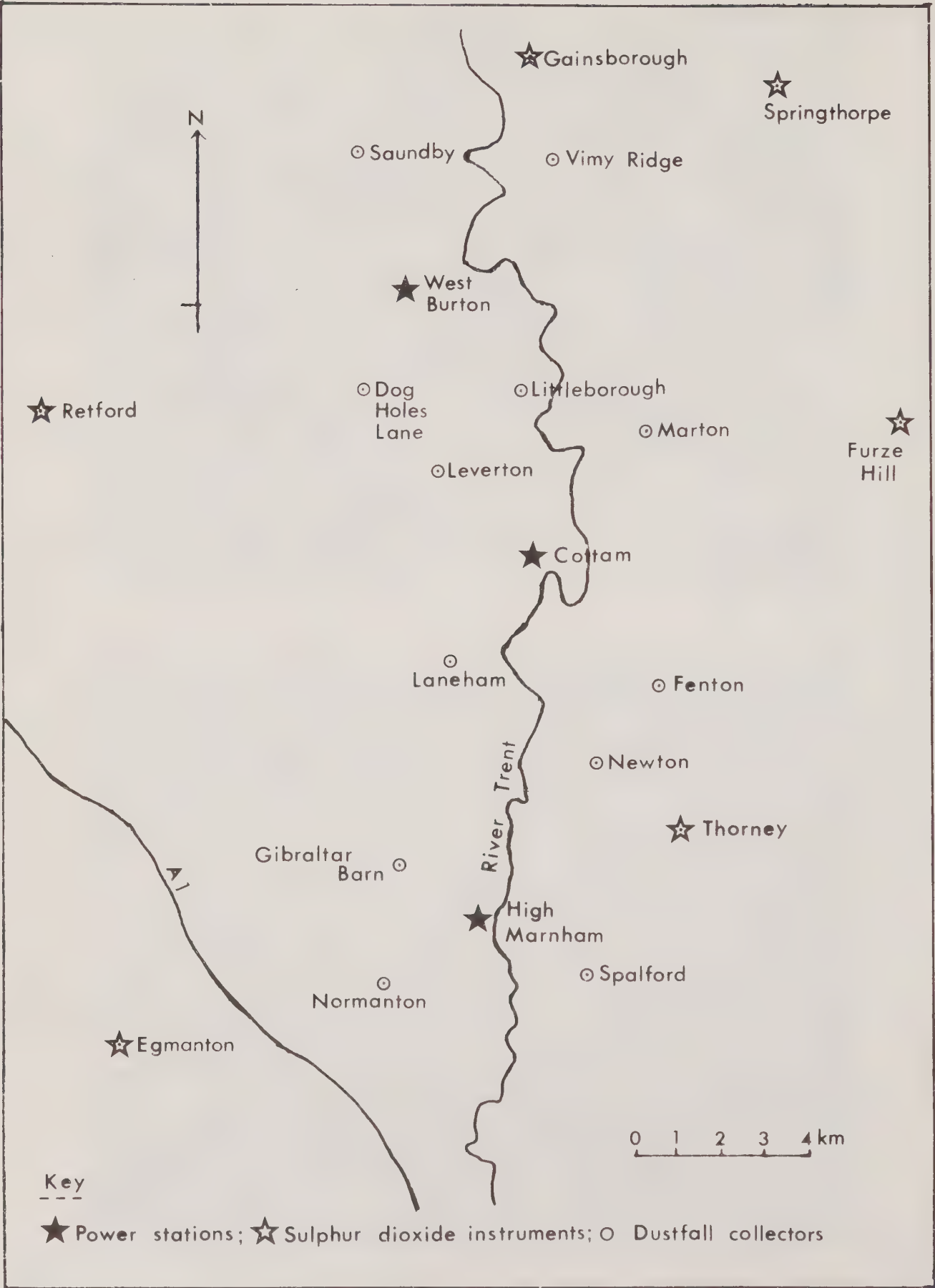


Figure No. 5 Locations of CEGB measurements of air pollution around High Marnham, Cottam, and West Burton Power Stations

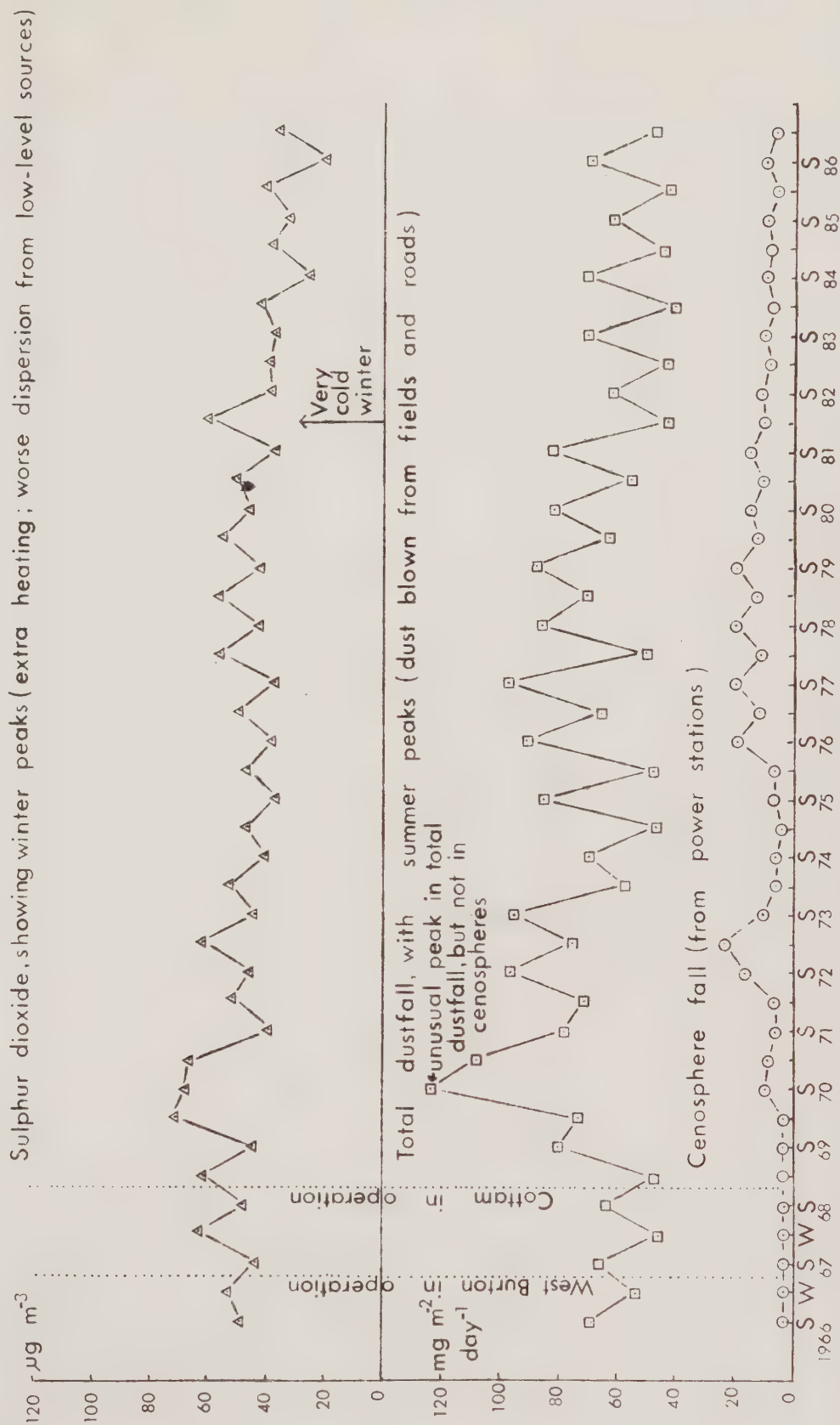


FIGURE
No. 6

First Report of the Civil Nuclear Power Working Group to the Technical Committee of the National Society for Clean Air — Summer 1988

Introduction

On 26 April 1986 the worst accident in the history of civil nuclear power befell the RBMK reactor at Chernobyl some 90 kilometres to the north of Kiev in the USSR. Within a matter of days the radioactive plume had traversed large areas of the USSR and Europe, requiring extensive emergency measures by all Governments concerned. Although the Russians coped admirably around Chernobyl itself, in Europe emergency procedures were found wanting and the profound and widespread concern throughout all sections of the community led members of the Society to request Council that it should re-examine the Society's policy on civil nuclear power.

At a joint meeting of the Technical and Parliamentary and Local Government Committees in July 1986 it was agreed that whilst the Society might not be able to cover the subject as comprehensively and as quickly as it wished, there were certain areas in which it should be able to make useful contributions. The Society should attempt to set the debate in the context of energy policy and its own stated policies, taking into account comparative risk assessments and economic factors. It should establish its position on safety and inspection at local, national and international levels and, finally, it should establish policy on information disbursement and the form in which it could best be achieved. The Technical Committee was invited to form a sub-Committee — subsequently named the Civil Nuclear Power Working Group (CNPWG) — with authority to develop a working agenda on the lines proposed; to co-opt members, organise briefings and visits, etc. as necessary.

Findings

Future of CNP

Although some foreign Governments have declared their intentions not to proceed with CNP and to decommission existing plant as soon as practicable, this is not the expressed policy of most of the major industrial nations. Inter alia, since the Three Mile Island accident in 1979 the United States has continued to commission plant already under construction (although it has not so far placed orders for any new plant), the French programme proceeds apace, the USSR has declared its intention to continue to expand its CNP programme and the UK Government has approved the Sizewell B project. Several of the developing nations are proceeding with their own programmes

and others have said that they see the introduction of CNP as fundamental to their future energy needs. In toto 23 nuclear reactors were newly connected to electricity grids in 1987 bringing the world's total number of nuclear electricity plants to 417 accounting for 17% of world electricity production.

Nationally and Internationally pressures to improve safety are receiving great attention in the more immediate post disaster times. Intentions to ensure the continued application of scientific, legislative and managerial means to improve safety and minimise risks will need to be properly applied.

The Chernobyl disaster was the direct result of a design incorporating suspect safety features coupled with the overriding of prescribed safety measures. Indeed, if adhered to, these would have prevented the catastrophe: they were in fact overridden by authority anxious to meet some particular contingency deadline. This points to the need to look into means of ensuring that familiarity and good safety records do not breed complacency and possibly contempt for the safety rules either by operational staff or the most senior authority.

Despite the serious consequences of the Chernobyl disaster and the risk of other severe accidents at nuclear power plants, CNP must be expected to represent a major future source of energy worldwide. The objectives of the Society should be therefore to do all within its power both nationally and internationally to ensure that optimum arrangements to deal with pollution problems arising from routine and accidental nuclear emissions are put in hand and continuously evaluated and updated. Additionally, we consider it self evident that all effective measures to conserve energy and to develop alternative and renewable sources should be promoted as a matter of urgency. A national strategy, taking into account the broad needs for environmental control, should be developed and opened to public debate.

Radioactivity — Public Education in Measurement and Dose Evaluation

The measurement of radiation and dose evaluation are complex and not immediately comprehensible to a majority of even the technically informed. We see, therefore, a need for (a) a long-term programme of education within schools; (b) an immediate requirement to make information available to all members of the public, giving a full explanation of the terminology and measurement of radioactivity and the factors taken into account in risk assessment; and (c) supplementary information targetted primarily at the media in the event of an incident. While acknowledging the many difficulties in so doing, we also consider that there would be advantage in producing a comparative Severity Scale for accidents which would assist in differentiating between the levels of threat posed by actual incidents.

Risk Assessments

The survey of questions asked by the "man in the street" indicated a widespread concern that central Government might choose to underplay or even mislead the public about the risks arising from specific incidents. In order to reassure the public, the basis for any decisions taken by Government should be publicly available. In accepting that only the technically competent would be in a position to assess the information, we consider that for practical purposes — because the public recognise them as a first point of contact — a chief responsibility for disseminating the information should lie with the local Environmental Health Department. Local authorities should have direct access to the NRPB and its information.

Evidence given to the Working Group by the NRPB and Friends of the Earth has pointed out that the ICRP risk estimates are currently being reviewed. FOE provided important evidence to suggest that the current ICRP figures might be too high by a factor of 5 and possibly as much as 10, and, as a matter of prudence, were urging that the NRPB should adopt lower figures. The FOE proposal has particular relevance to the occupational exposure of women in pregnancy and the possible criticality of the foetus to very low exposure levels. In fact, a preliminary reassessment by ICRP has now prompted NRPB to propose targets for the general public relating to doses resulting from discharges from nuclear installations which are one half of the current limit for the total dose from any one nuclear installation. For workers NRPB have proposed an annual average target which is one third of the present maximum dose received in any one year. In general, the main route to dose limitation remains the application of the ALARP principle.

Emergency Procedures in the event of Incidents Overseas

While noting that these are currently being reviewed by HM Government, we are in no doubt that local government officers as well as the public were confused by the procedures imposed by Government during Chernobyl. Additionally, NRPB (which is responsible for its administration) admitted that the NAIR Scheme "had not worked well". We believe therefore that the consultation arrangements between Government departments (DOE, MAFF, D. of TpT, etc.) and local agencies including the police, emergency services and environmental health departments should be reviewed and exposed to public discussion as a matter of urgency.

Radiation Monitoring

Tracking and forecasting the effects of the Chernobyl plume left much to be desired. Exchange of data with overseas countries was largely ad hoc and

mostly through a variety of personal contacts. Data exchange with France was formalised but possibly not comprehensive. The NRPBs own reporting chain is limited and originally designed to monitor fallout from weapons testing. Additional data was received from CEGB, UK Atomic Energy Authority (AEA) and, possibly, MOD stations. The Government's Proposals — The National Response Plan and Radioactive Incident Monitoring Network (RIMNET) to Nuclear Accidents Overseas — list a possible 80 sites throughout the UK located at meteorological stations, defence establishments, government laboratories and NRPB centres. Routine monitoring will be based primarily on gamma-ray dose rate measurements. Some other forms of routine monitoring at these sites — of air, rainwater and deposition — and/or primary water supplies will also be undertaken. Data collection and the initial assessment will be automated, and all information will be analysed regularly to detect changes in radiation levels. Back-up systems are proposed and the system will be able to accept data from local authorities where this has been collected and supplied according to agreed procedures. The RIMNET system will not be geared to monitoring short range hazards of a nuclear installation accident in this country but will be used to help assess the long range effects of such accidents. We consider this good as far as it goes. However, depending on the rainfall fallout concentrations can be highly localised — thus we consider the more monitoring the better and urge international as well as national attention to increase the number and diversity of monitoring locations.

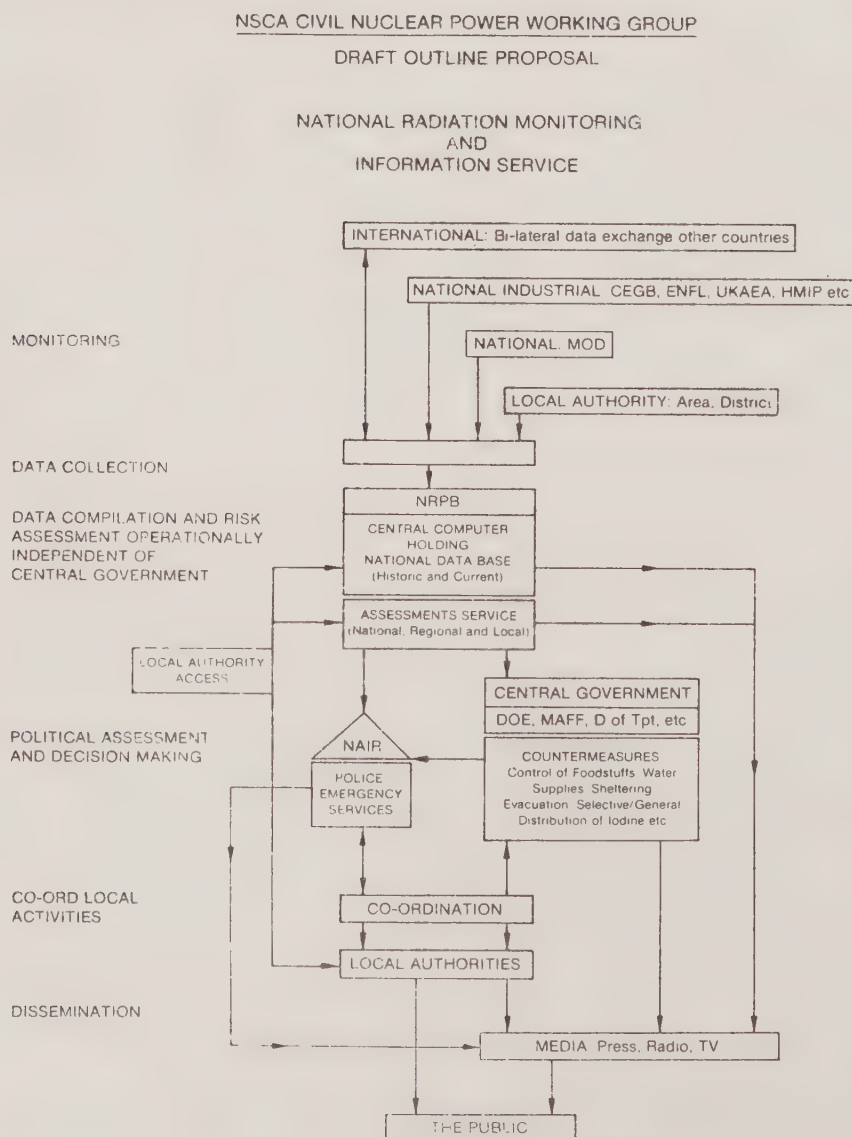
It is apparent that local authorities wish to monitor in order to provide independent checks on published data and to supplement it on a local basis. We understand that some 120 LAs have already established their own programmes to measure routine trends in local levels and, during incidents (whether in the UK or overseas) obtain data on local concentrations. We see this process of "checking the checkers" as an essential confidence building measure. The local authority associations have through joint discussions continued to make considerable progress in instructing plans for a national network of the monitoring schemes run by Councils individually or in collaborative groups. It now appears likely that the Local Authority Radiation Monitoring and Collation Centre (LARRMACC) will be an accredited radiation and radioactivity monitoring network with direct access to government agency data. While fulfilling some of the criteria we have identified it seems to us that this scheme is unnecessarily complicated and expensive. The Government should welcome routine LA monitoring as politically as well as scientifically desirable: we do not understand the objections to establishing a single independent ongoing national scheme.

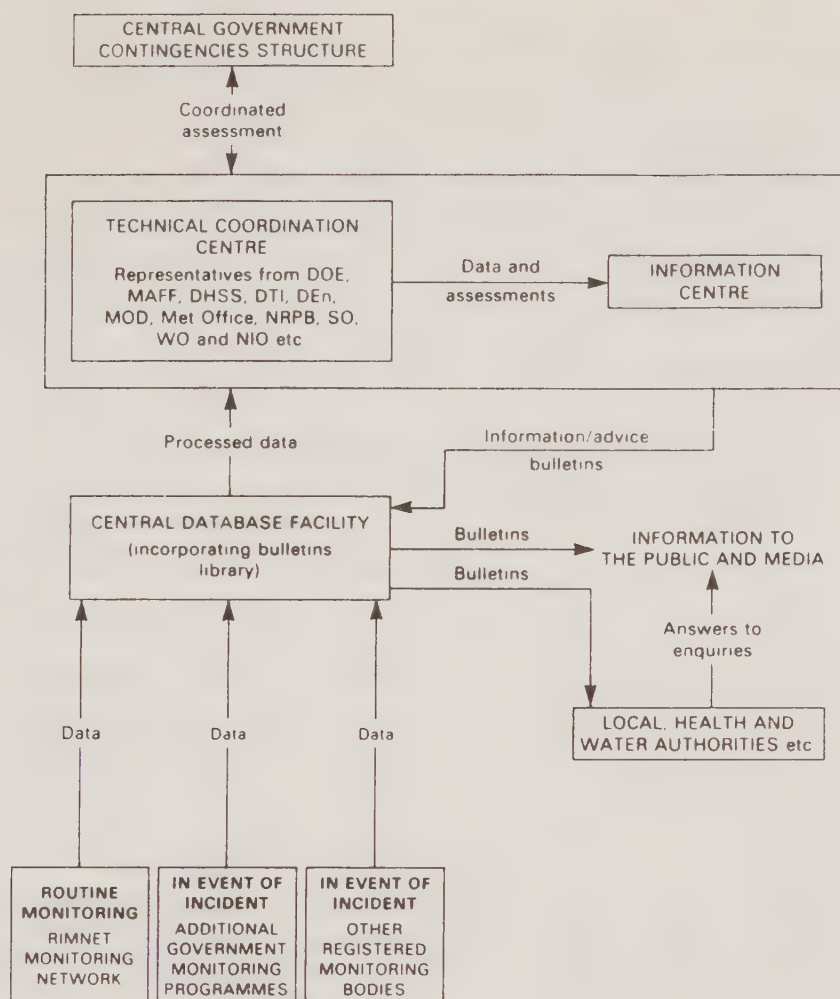
We consider, therefore, that all data — international, national and local —

should be tabulated in a national data bank to provide both historic and current radiation levels affecting the country and, in conjunction with the Met Office, forecasts of fallout. Local authorities should have access to the national data base both to validate their own data, confirm nationally published figures and to obtain forecasts as appropriate. It must be clear to all that the data base is independent of central Government, e.g. operated by NRPB.

National Monitoring and Information Service

Following from this, our preliminary proposals on the broad arrangements for a national monitoring and information service are summarised diagrammatically at Figure 1. The Government's proposed form of National Response Plan system is shown at Figure 2. It is immediately apparent that the latter combines risk assessment and the consequential political decision making process of Government in a single "Technical Coordination Centre". As stressed previously, we consider that public reassurance requires that the





basis for government action should be publicly available — and it follows from this that those responsible for assessing the risk should be clearly independent of Central Government. We consider therefore that until the NRPB is decoupled from Central Government the RIMNET proposals are unacceptable. Unlike the Government proposal we also believe that any authority should have direct access to the risk assessment — not just a “briefing bulletin”, whatever that may be. Given this, the political assessment and decisions that follow should then be confidence building. As for the resources necessary to meet our proposals we believe them to be relatively modest.

Plant Safety/Watt Committee Recommendations

The interim report of the Watt Committee “A Review of the Chernobyl Accident and Its Implications for the UK” has been published. We recommend that the Society should endorse this report. We note too that the safety implications of constructing a modified PWR reactor of the type proposed by the CEBG for Sizewell B have been subjected to the most thorough public investigation yet made for any reactor anywhere. In presenting his report Sir Frank Layfield pointed out that the overwhelming

weight of scientific evidence indicated that such a reactor would be entirely safe in the sense that in the event of an incident there would be no risk of an escape of radiation. The government has, therefore, accepted the reactor design as being "safe" and proposals for further reactors of this type are now being considered. In passing, we note that the French PWR design of which some 38 are in use or under construction incorporate the same safety features as those for Sizewell B. We believe that this is appropriately reassuring.

Handling of Nuclear Materials and Waste Disposal

The handling and transportation of nuclear materials was not reviewed in any detail by the Working Group. It is considered that this aspect of the nuclear fuel cycle does not pose any serious threat to clean air concerns.

Policy on nuclear waste disposal is under review at the present time. A discussion document — "The Way Forward" — has been published by UK NIREX in order to develop a strategy for the disposal of low-level and intermediate-level radioactive waste (LLW & ILW). Heat-generating high-level waste (HLW) will continue to be stored on the surface for at least 50 years; as yet there are no plans for its ultimate disposal. It should also be noted that the plans currently under discussion appear to exclude nuclear waste arising from military sources.

LLW and ILW comprise a range of waste materials from nuclear processes, with a range of radioactivity, which must be isolated from the environment. By the year 2030, civil sources will have produced about 1,000,000 m³ of LLW and 300,000 m³ of ILW. This is equivalent to 2 million tonnes of packaged material. The volume and mass involved could be contained in surface or shallow burial facilities without undue difficulty, and adequate radiation protection could be achieved by such methods. However NIREX has not considered the option of surface storage because of the "large volume" involved, and the possibility of shallow burial seems to have been discounted because of the public opposition which previous proposals have provoked. The three options considered by NIREX, therefore, all involve deep burial of waste; either on land, or under the sea in which case the repository may be accessed either from land, or offshore. Whatever the technical merits of other options, it seems that some form of deep burial will be chosen. This is not necessarily the Best Practicable Environmental Option (BPEO), but is likely to be more publicly acceptable.

We consider that if waste is safe enough to be stored above ground without further treatment, it should be safe enough to bury. Given the likelihood that the waste containers will eventually breach, the waste should be of a

low enough activity at that time, and the surrounding geology of a suitable type, to ensure that radioactivity does not escape into water-permeable strata. Whilst a waste repository should be subject to thorough environmental monitoring, the essential safeguard must be that only waste of relatively low activity should be buried. In this case, retrieval of waste containers should prove unnecessary. Disposal options for HLW have yet to be determined; at present HLW is kept in a liquid form, and generates heat. We are concerned that, as HLW becomes physically cooler, it should not be automatically reclassified as ILW and thus suitable for burial; the current NIREX proposals should not enable HLW disposal by the "back door". A separate assessment of the BPEO for a HLW disposal route is indicated.

There may still be problems in finding a suitable site for a deep waste depository. Undersea placement runs the risk of running foul of international opinion, particularly under the provisions of the 1972 London Dumping Convention. As with shallow burial, the "not in my backyard" syndrome may rule out many land-based options, and the problem of spoil disposal may arise. An existing nuclear site, where public opinion may be more favourable would be a likely choice. About half of all nuclear waste is generated at the Sellafield reprocessing plant, and in order to minimise transport of waste to a single repository, this site would be an understandable choice. However, the geology of the area may not be optimal. Again, we are concerned that this site may be favoured through political pragmatism, rather than as a BPEO.

Our main concern is that the BPEO for radioactive waste disposal be developed. As recommended in the Royal Commission on Environmental Pollution's 12th Report, the process of arriving at a suggested environmental option should be clearly explained. If decisions are taken for reasons of political expediency rather than purely environmental considerations, this should be stated. The Royal Commission's 12th Report was critical of the 1986 DoE report on the BPEO for management of LLW and ILW. We therefore recommend that a new BPEO study should be undertaken, using the new systematic approach developed by RCEP. With a clear explanation of the reasoning for an environmental option, and the options foregone, a decision should be reached which commands the maximum public confidence.

Energy Policy and Conservation

We have commented earlier on the requirement for a national energy policy which would take into account conservation measures and more environ-

mentally-benign energy sources. The need for such a policy has long been argued by the Society included, *inter alia*, in its endorsements of the 5th and 10th Reports of the Royal Commission on Environmental Pollution and the CENE Report "Coal and the Environment". Indeed the requirement seems so self evident that it has become a matter for wonderment that it should be so conspicuously ignored.

Recommendations

1. **Public Education.** A programme of public education about radioactivity is indicated, with particular emphasis on schools, and in the event of an incident, the media. Public scepticism about "official" risk information released during incidents would be avoided by the adoption of an information system which is open and independent of Government. The chief responsibility for informing the public during incidents should lie with the local Environmental Health Departments.
2. **Risk Assessment & Radiation Monitoring.** Because of the likely variability in fallout, more than the 80 monitoring stations proposed in the Government RIMNET proposals are needed. Local authorities could provide valuable additional cover, and the proposed LARRMACC scheme is likely to consolidate LA monitoring. However NSCA would prefer to see a single, independent monitoring system under the NRPB, rather than two parallel systems (RIMNET & LARRMACC), both of which may be suspected of political bias. NSCA's own proposals are shown at Figure 1. A national data bank, co-ordinated by NRPB, should be seen to be independent of Government influence. All authorities should have direct access to the data.
3. **Nuclear Waste Disposal.** A new study should be undertaken to determine the BPEO for the disposal of Intermediate and Low Level Wastes. If suboptimal solutions have been proposed because of public pressure, this should be openly acknowledged.
4. **Energy Policy.** All effective measures to conserve energy and to develop alternative and renewable sources should be promoted as a matter of urgency. A national strategy, taking into account the broad needs for environmental control, should be developed and opened to public debate.

NSCA TRANSPORTATION NOISE SURVEY

Noise nuisance from transport is a fact of life in most parts of the UK today. However the sources of transportation noise, and the responses of local authorities vary widely. Last year the NSCA Transportation Noise Working Group undertook a survey of all local authorities in order to establish an overall picture of the problem. Highways, Housing, Planning and Environmental Health Departments all have an interest in the subject, and were surveyed in four separate questionnaires. The results are summarised below.

NSCA Transportation Noise Questionnaire No. 1 (Highways Authorities)

Final results — 27 replies

1. 72% of authorities had constructed or improved highways in the last 5 years. Of these, an average of 178 properties were affected in each authority area (range 0-900). About half of the authorities undertook EIA of schemes beforehand; most of them found the DoT Manual of Environmental Appraisal helpful.
2. An average of 58% of schemes gave rise to mandatory duties under Noise Insulation Regulations (range 0-100%).
3. Fewer than half of authorities exercised discretionary power to grant insulation where there was no duty to do so.
4. An average of 18% (range 0-70%) of schemes optimised use of route alignment barriers to minimise the degree of insulation needed.
5. Few authorities gave figures on the percentage of schemes for which insulation was granted during construction of highways (range 0-50%).
6. About half of the authorities have adopted alternative approaches to curbing the impact of transportation noise. Management schemes have included — parking restrictions or night-time bans on HGVs; width/weight restrictions; diversions and advisory routes; pedestrianisation and creation of cul-de-sacs; policies designed to promote cycling, public transport use, etc.
7. Few authorities had exact figures on complaints; most said that the numbers were large. Common complaints were about HGVs, motorcycles, noise from poor road surfaces, increases in traffic on unimproved roads.

Comment The level of data here was fairly poor. Analysis of all 27 returns suggests that the numbers of properties insulated under mandatory provisions are low — from 0-a few hundred properties over 5 years. Discretionary insulation only operates at a low level — from 0-5% of schemes.

NSCA Transportation Noise Questionnaire No. 2 (Housing Departments)

Final results — 63 replies

1. 66% of housing authorities took noise into account when designing housing estates. Measures include secondary glazing, consideration of orientation and distance from roads, noise mounds and screens.
2. About half had carried out remedial work to glazing to improve sound insulation. Most mentioned Noise Insulation Regulations 1975 and Land Compensation Act 1973 as the source of layout and design criteria.
3. 24% of authorities had considered improving sound insulation when making improvements to glazing. Only 5 authorities actually mentioned specific criteria levels; 4 used 68 dBA L10 18hr, the other 60 dB(A) exterior, 40 dB(A) interior.
4. About half included specific noise insulation measures in new housing development. Again, about half would consult their Environmental Health Dept where transportation noise might affect housing.
5. Housing departments seem to receive very few complaints about transportation noise.

NSCA Transportation Noise Questionnaire No. 3 (Planning Authorities)

Final results — 81 replies

1. 64% of planning authorities set conditions requiring specific sound insulation measures for protection against traffic noise.
2. Many differing criteria are used to determine when measures are required. Most refer to 'Planning and Noise' DoE guidelines 10/73. Some use full L10 18hr tests (varying levels 60-68 dB(A)), others give spot figures, or figures for shorter periods. To assess aircraft noise NNI contours are used by all. Some district plans have incorporated noise reduction criteria, and may differentiate between classes of buildings, eg caravans and hospitals are most vulnerable, followed by houses and schools, and finally offices.
3. About 83% of planning departments consult their Environmental Health Dept where noise might affect housing.
4. Very few planning departments seem to receive complaints about traffic noise.

Comment A variety of criteria were used, and it was not always clear where these were used as a threshold above which soundproofing measures were required, or development discouraged altogether. All criteria were based on the DoE circular 10/73 Planning and Noise, and the subsequent

Noise Insulation Regulations 1975, or their Scottish or Welsh equivalents. In addition to external dBA values, some authorities also gave internal values.

Number of Authorities	Level <i>External</i>	Comment
1	70dBA Leq 1hr	All development refused
1	70dBA L10 18hr	All development refused
4	68dBA L10 18hr	
6	65dBA L10 18hr	some refuse development* others require measures
3	60dBA L10 18hr	soundproofing required
2	60dBA Leq 24hr	for railway traffic
	<i>Internal</i>	
1	50dBA	
2	50dBA L10	
1	45dBA Leq 1hr day/35 night	
1	40dBA L10 7am-10pm/30 10pm-7am	
1	35-40dBA in bedrooms	

* One authority said it would prefer 60dBA, but that this would 'sterilise' too much land for development.

Some County Councils (eg Cheshire & Notts) have Noise Units to give advice. Some planning authorities have published their own guidelines for planning and noise.

NSCA Transportation Noise Questionnaire No. 4 (Environmental Health Departments)

Final results – 262 replies

1. 28% of departments had airports in their area; most had major roads; 80% had main rail lines.
2. On an index of 1-4 (little problem/moderate problem/substantial problem/overwhelming problem), the road average was 2.3 (range 1-3); aircraft 1.5 (range 1-4); rail 1.2 (range 1-3).
3. 68% of departments saw road traffic as an increasing problem; 36% saw air traffic as an increasing problem; 8% for rail.
4. About half of the departments mentioned existing or planned developments for which existing noise insulation regulations are inadequate. By far the majority identified the problem of increased traffic noise on existing roads, where there is no legal obligation to upgrade insulation. Typical

causes include new commercial or industrial developments; existing roads which have become feeder roads for new highways (eg M25); or simply a general increase in traffic levels. Some more specific local problems have been caused by bus deregulation (buses using new routes through residential areas); low flying military aircraft; helicopters in urban areas.

5. Only a half of departments felt that they had been properly consulted about such developments, although some lay outside their official remit.

6. 89% of departments were consulted on other relevant planning matters where housing is affected by transportation noise. For most, this happens as part of normal planning procedure.

7. The number of complaints received by EHDs about transportation noise varies enormously, from "few" to "too large to quantify".

Comment More detail about the source of transportation noise was forthcoming. They can be categorised as follows:

(a) Common: early/late movement of HGVs; refrigeration plant on HGVs running overnight; motorcycles on open land; empty HGVs rattling.

(b) Less common, but locally annoying: microlite aircraft; parachuting activities; stock cars; airships; helicopters; Tyneside Metro; W. Midlands Rapid Transport system.

EHOs comments were most commonly:

- main problems caused by existing noise on unimproved roads.
- knock-on effect of new highways on feeder roads often ignored.
- traffic implications of new developments (warehouses, etc) often ignored.
- many London/Southeast authorities worried by Channel Tunnel effect on road/rail traffic.
- level of complaints does not reflect the true picture, rather the public's realisation that little can be done about traffic noise.
- pressure to raise dbA criteria to encourage development. One authority is re-evaluating its 60dbA Leq 18hr threshold, and may raise it to 70.

Analysis The survey gives a snapshot picture of the transportation noise issue around the country. Problems, perceptions and solutions, as may be expected, vary widely. How does the NSCA intend to use this information to develop its work in the noise field? The most effective course is to identify one or two particular areas where effort may best be concentrated. Our work in the field of motorcycle noise is a good example, and one which is yielding real results. A summary of this survey will be circulated to all participating authorities, along with a request for further information about

one or two issues which we wish to investigate in more detail. A shortlist of possible subjects for such investigation will be compiled, from the results of the original survey, and through consultations with the NSCA Noise Committee. If Clean Air readers have their suggestions for investigation, Tim Brown at NSCA would be pleased to hear from them.

VOCs/HYDROCARBONS EMISSIONS: NSCA POLICY STATEMENT

1. Introduction

Hydrocarbons are the essential components of fossil fuels; strictly defined they are organic substances composed only of the elements hydrogen and carbon. However, in the context of air pollution control, the term has been expanded to include more complex organic chemicals containing other elements. A more accurate generic term is Volatile Organic Compounds (VOCs). Many VOCs occur naturally, but in Europe about half of atmospheric VOCs are of man-made origin. In the UK, these originate primarily from the evaporation of solvents, motor vehicle emissions and gas distribution losses.

Some VOCs are carcinogenic, or directly toxic to human health. However the major significance of VOCs for air pollution lies in their role, together with oxides of nitrogen (NO_x), in the formation of photo-oxidants such as ozone and peroxyacetyl nitrate (PAN). High ozone concentrations at ground level can cause plant damage and possible adverse health effects. A second area of concern is the effect of VOCs, particularly methane, on the global atmosphere. Unfortunately the wide range of VOC compounds, their sources, and the complexity of their interaction with other atmospheric components makes it difficult to develop comprehensive control strategies.

2. Sources of VOC Emissions

The table below (taken from the latest — No. 10, 1987 — Digest of Environmental Protection and Water Statistics [DOE, 1988] — shows estimated man-made VOC emissions for the UK.

It will be seen that industrial processes/solvents (52%), gasoline engined vehicles — “road transport” (28%), and the gas distribution system (10%) are the largest sources of VOCs.

3. Reactivity Rates and Control Strategies

The extent to which emissions of VOCs contribute to the ozone concentra-

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Percent of total 1985
Hydrocarbons												
Domestic	102	105	95	98	81	77	75	70	56	74 ^R	78	4
Commercial/public service ³	1	1	1	1	1	1	1	1	1	1	1	—
Power stations	13	13	13	14	14	14	13	13 ^R	10	12	13	1
Refineries	1	1	1	1	1	1	1	1	1	1	1	—
Other industry (fuel use) ⁴	4 ^R	4 ^R	4 ^R	4 ^R	4	3 ^R	3 ^R	3 ^R	3	3 ^R	3	—
Rail transport	11	11	11	11	10	10	9	10	9	10	10	—
Road transport ⁶	456 ^R	468 ^R	494 ^R	504 ^R	509 ^R	501 ^R	526 ^R	531	538	544	573	28
Incineration and agricultural burning	38	38	38	38	38	38	38	38	38	38	38	2
Gas leakage ⁷	142 ^R	147 ^R	155 ^R	171 ^R	173 ^R	174 ^R	176 ^R	180 ^R	186 ^R	198 ^R	201	10
Industrial processes and solvent evaporation ⁸	1,043 ^R	1,045 ^R	1,051 ^R	1,053 ^R	1,055 ^R	1,053 ^R	1,056 ^R	1,058 ^R	1,061 ^R	1,062 ^R	1,068	52
Forests ⁹	80	80	80	80	80	80	80	80	80	80	80	4
All sources ⁵ (ground-based)	1,890 ^R	1,914 ^R	1,943 ^R	1,974 ^R	1,966 ^R	1,952 ^R	1,979 ^R	1,984 ^R	1,982 ^R	2,023 ^R	2,065	100

¹ For the main part of the table these figures are based on constant emission factors and do not take into account possible reductions in emission factors as a result of ECE regulations.

² Expressed as nitrogen dioxide equivalent.

³ Includes miscellaneous fuel consumers.

⁴ Excludes power stations, refineries and agriculture.

⁵ Excludes emissions from fuel used for water and air transport.

⁶ Includes evaporative emissions from the petrol tank and carburettor of petrol-engined vehicles.

Source: Warren Spring Laboratory, Department of Trade and Industry

⁷ Gas leakage is an estimate of losses during transmissions along the distribution system. The estimates have been revised after discussions with British Gas.

⁸ Including evaporation of motor spirit during production, storage and distribution.

⁹ An order of magnitude estimate of natural emissions from forests.

R = revised since last publication

tion is difficult to determine. Many VOCs react quickly to produce ozone and thus have a short lifetime in the atmosphere; others are relatively unreactive. This has important consequences for control strategies. For instance methane, the simplest and most volatile hydrocarbon, is very slow to react and the formation of ozone is minimal during one day's photochemistry.

However where ozone-producing conditions extend over several days the lower-reactivity species including methane begin to react and produce ozone. The fact that there is a comparatively high natural background level of methane further complicates the picture. Modelling work is underway in Europe, attempting to calculate effects of various control scenarios on ozone formation at ground level.

There is evidence that in the free troposphere, (i.e. from an altitude of about 1 km up to about 10 km), ozone concentrations may be increasing as low-reactivity gases released in the boundary layer, such as methane, find their way into the free troposphere and form ozone as they are degraded. Significant increases in methane releases at the surface could in principle therefore lead to increases in tropospheric ozone which acts, as does methane itself, as a greenhouse gas.

Thus controls on VOCs must be considered from the standpoint both of ozone-producing potential (rather than simply mass emissions) and of direct effects on human health. The ozone-producing potential of VOCs is critically dependent upon chemical interactions with NO_x, emitted mainly from motor vehicles and power stations, and also the subject of proposed controls. So the balance of controls on NO_x and VOCs will have an important effect on ozone concentrations. In some regions NO_x control alone, or NO_x reductions much greater than VOC reductions, might actually increase ozone in the near-field. However, at much longer timescales (i.e. many days), and probably in the free troposphere, NO_x reduction may be the more efficient method of reducing ozone concentrations. Essentially, both NO_x and VOCs need to be controlled in tandem, allowing for the consequences of their interrelationship.

4. Prospects for Control: Fixed Sources

Solvent emissions from industry make up the bulk (52%) of UK VOC emissions in mass terms. Major contributors include the paint, printing, adhesives, pharmaceutical, brickmaking, coking and fermentation industries. A further 10% of total VOC emissions derive from the UK gas distribution system. Gas leakage is estimated at 1% of that distributed, and is being

further reduced as the system is renewed. VOCs emitted by industrial and commercial activities from fossil fuel combustion use rather than evaporation, including oil refining and distribution, account for only about 5% of the UK's total emissions. These are being controlled by improved design and maintenance of plant and equipment.

Control strategies in this sector are process-specific; the degree and type of emissions vary widely. Realistic BPM notes for particular processes would seem to offer the best opportunities for control, but detailed information on industrial solvent emissions is still scarce, and further research is essential before BPM can be assessed. Another approach is to develop substitutes for processes and products which rely on VOCs, where this is feasible.

5. Prospects for Control — Mobile Sources

In the above table the DOE has grouped together a number of sources of VOCs under the heading "road transport". These can be broken down further as follows:—

60% = exhaust emissions

40% = direct losses from vehicles, of which:

5% = generated by refuelling at service stations

35% = evaporative losses (ie, operational losses).

Finalisation and implementation of the updated "European Standards" for motor vehicle exhaust emissions will lead to further reductions in VOCs in exhaust emissions, along with NO_x. The EC's 5th Amendment to 70/220/EEC — the Exhaust Emissions Directive (the "Luxembourg Compromise") has now been adopted. This will result in a reduction of between 60 and 85% of the uncontrolled levels of HC + NO_x, and between 77 and 90% of the uncontrolled levels of CO in exhaust gases. It is relevant that the reductions for the "medium" class (1.4 to 2.0 litres CC) are quite close to those for the "large" class; the limits set for the large cars being directly comparable in severity to the much lauded "US 83" emission levels. The medium car class accounts for around 50% of the European market (Ford figures) so the reductions in this sector are important. Controls on the small car sector are significantly weaker in comparison with the US and Japan, although the so-called "Stage II" Luxembourg limits for Hydrocarbons and NO_x from small cars now agreed will further reduce emissions from these vehicles. Given the technological developments which seem likely — 3-way catalysts, lean-burn with oxidation catalysts — and the fact that within 10-20 years many cars will have fuel injection rather than carburettors (which account for a large fraction of evaporative emissions from vehicles), there may be little more that can practically be done to control exhaust emissions.

The 5th Amendment to the UNECE Regulation 15 includes a requirement for the control of evaporative emissions which is in line with controls existing in the USA. It is anticipated that this part of the ECE regulation will be introduced into EEC directives on vehicle emissions. This would involve the procedure known as the SHED test which will require the vehicle to be completely enclosed under controlled conditions and evaporated emissions from *all* sources including paintwork, fuel system, upholstery etc to be collected and measured.

Vehicle and fuel system design has the greatest influence on automotive evaporative losses. Reduction of the volatility of petrol can also reduce evaporative emissions, but this is limited by technical requirements of the fuel in respect to engine starting and driveability. In Europe as a whole, evaporative losses can be reduced by up to about 10% by this means. A better than 90% reduction in fuel system evaporative emissions is claimed from fitting charcoal filter canisters to vehicles. The latter can also reduce or eliminate VOC emissions which occur during vehicle refuelling. There are good prospects for reducing evaporative emissions in this way; the technology is fully developed and cheap to install. Canisters have been required for all cars in the US, including European imports, for ten years.

6. NSCA policy development

The Commission of the European Communities has decided to propose a broader control strategy for VOCs. The targets are not yet determined and the NSCA is thus in a position to influence UK Government and Commission thinking on the subject. It is clear that VOCs should be subject to further control, but NSCA would urge further research into the relative significance of NO_x and VOCs in the formation of photo-oxidants, so that meaningful legislation may be formulated.

(a) Fixed Sources. NSCA considers that equal weight should be given to controls on solvent evaporation from industry, which is a greater source in mass terms of volatile organic compounds than vehicles. In some industries more research is essential before control strategies can be developed. Product substitution should be encouraged where appropriate.

(b) Mobile Sources. NSCA applauds the continuing attention to controls on gaseous exhaust emissions in the automotive sector. The adoption of charcoal canister technology would significantly reduce evaporative emissions. NSCA notes the comparatively lenient controls agreed for small cars in Europe compared with the US and Japan. Policy in this area will be kept under review as the outcome of current research is evaluated.

LETTER TO THE EDITOR

**DESULPHURISATION OF FLUE GASES
IS THERE ANOTHER WAY TO REDUCE THE ACID RAIN PROBLEM?**

Sir,

Britain has been called "the dirty man of Europe" by its European Community partners at recent conferences concerned with the environment. One reason why is that we will not join the so-called 30% club to reduce overall SO_2 emissions by 30% by 1993 based on 1980 emission levels. Many papers have been written on the very complicated subjects of transboundary transportation of pollutants and their effects on forests and fish in rivers and lakes. Based on the evidence to date, the government has decided to fit desulphurisation at three major existing coal fired stations totalling 6000 MW of generating capacity and at all new coal fired power stations.

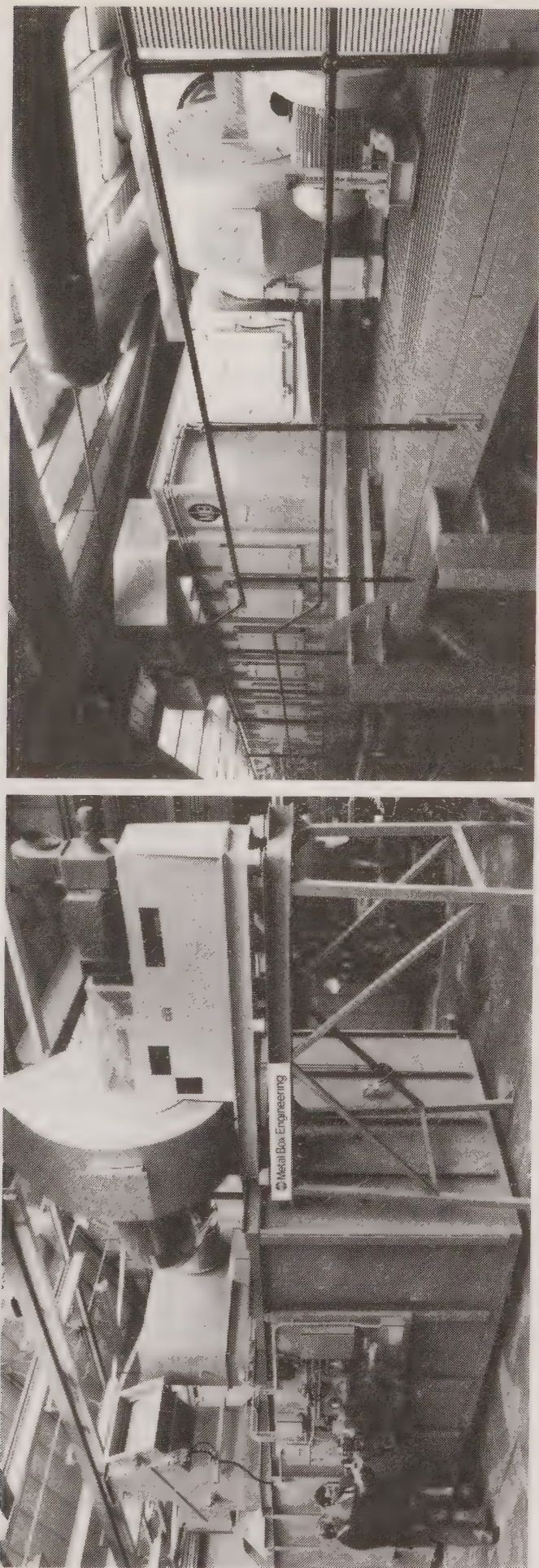
It would appear that this step has largely been taken to satisfy our European partners, particularly those in Scandinavia. Retro-fitting of desulphurisation not only increases the fuel required to produce a given power output but increases the cost of electricity by some 10% at each station where the system is fitted. Neither British Industry nor the British public will welcome that rise, particularly when it is known that the price of electricity is already lower in other industrial countries nearby, such as France.

I suggest that there is an alternative or supplementary method which should be studied and which would be particularly suitable for Britain, namely the injection of an additive for neutralising acids into the flue gases at the outlet from the electrostatic precipitators fitted on coal fired power stations. The technique for injecting a suitable agent, very finely divided magnesium hydroxide powder, is already well known as it is widely used for a different purpose (neutralising sulphuric acid deposited on cool surfaces in chimneys to prevent acidic smut emission) with oil-fired boiler plant and when oil-firing supplements coal-firing.

Of the 19 coal-fired power stations with a capacity of 500 MW or greater operated by the CEGB in Britain, only 3 will have desulphurisation by the middle of the 1990s. The remaining 16 will be untreated.

Britain is an island off the coast of Europe lying well to the south-west of Scandinavia and this should be taken into account when considering trans-boundary transport of oxides of sulphur. Measurements have been made by the CEGB of the sulphur dioxide content of a power station plume as it travels across the North Sea. They show that dry precipitation of SO_2 occurs at about 5%/h and that at least 50%, and probably 75% or more, will precipitate into the sea in transit between Britain and Scandinavia. A percentage will be oxidised to SO_3 in transit. Under wet weather conditions in the Scandinavian mountains, a proportion will be precipitated in so-called acid rain.

If magnesium hydroxide of an appropriate particle size is added to the flue gases at the power station, very little of the additive will be lost as dry precipitation over the North Sea but a high percentage will precipitate with the rain in Scandinavia. The magnesium hydroxide will not react with the acids in the plume but will neutralise acids, particularly sulphuric acid, on the ground and in the streams and lakes.



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The mean particle size of the proposed magnesium hydroxide powder is 3 microns diameter. The very low rate of dry precipitation and high rate of wet precipitation which occurs when dust of this particle size is carried in the atmosphere is clearly illustrated by comparison with Saharan dust and with precipitation measured by scientists from the Institute of Terrestrial Ecology of radioactive caesium compounds transported in the radioactive cloud from Chernobyl. When this cloud passed over southern and central England, the weather was dry and the measured precipitation on grass was less than 10 Bq/m^2 . Rain was encountered over Wales, the Lake District and south west Scotland and the measured precipitation rose dramatically to 1000 Bq/m^2 and peaked at some 4000 Bq/m^2 .

Sir John Mason, The Royal Society, said at a recent NSCA conference that 2/3 of the acidity in Norway is due to wet precipitation and that 30% of wet acid rain precipitated during less than 3% of wet days. The magnesia rain system would be controlled in a scientific manner using meteorological forecasts so that injection would take place only when specified weather conditions were forecast, notably when the wind was from the western segment, conditions were comparatively dry over the North Sea and wet precipitation over ecologically sensitive regions in Scandinavia was anticipated.

There have been reports of acid rain affecting areas of Scotland. The Magnesia Rain technique could probably be applied effectively at local Scottish power stations, such as Longannet, again using weather forecasts and scientific control of injection.

It is claimed in Britain that we apply three criteria relating to pollution control.

(a) We use the best practicable means.

Desulphurisation is very expensive to install, takes several years to retrofit and is expensive to operate.

The Magnesia Rain system could be operated almost immediately, the additive is readily available, there would be no loss in plant efficiency and the operating cost would be about one-tenth of desulphurisation for a similar effect in ecological sensitive regions.

(b) We use the best practicable environmental option.

The most commonly used desulphurisation method involves quarrying of large quantities of limestone, frequently in areas of outstanding natural beauty, which has to be crushed and conveyed to the power stations. An approximately equal volume of effluent has to be conveyed from the power stations for disposal.

The Magnesia Rain system involves manufacture of magnesium hydroxide by precipitation from the sea at a plant at Hartlepool using the same weight of dolomite as the hydroxide produced. The quantity required to be conveyed to each power station would be well below one-tenth of the weight of limestone for desulphurisation and there would be no effluent for disposal.

(c) The polluter pays.

With desulphurisation the CEGB will pay very heavily at 3 power stations and nothing at 16 power stations.

With the Magnesia Rain system, using control by meteorologists, the cost would be

less than one-tenth of the cost of desulphurisation at each power station. In practice, it could be even lower in cost and just as effective in the ecological sensitive regions.

Full scale trials require to be carried out with the Magnesia Rain system.

BYROM LEES, MSc.

* Editor's note: we would welcome the views of readers on this subject, both of the practicability of the proposal, and of the ethical aspect of using one pollutant to counteract the effects of another.

UPDATE

NEW REPORT ON MOTORCYCLE NOISE

A new report, issued by the Manchester Area Council for Clean Air and Noise Control (MACCANC) is the most up-to-date review of the problem of motorcycle noise. Prompted by the rising number of complaints about noisy motor-bikes, the MACCANC report assesses the laws and regulations which apply, and finds some glaring omissions which make it difficult to control the problem. Regulations on motorcycle manufacturers ensure that new machines are properly silenced, but once in use, silencers can become worn or defective, or replaced with non-standard parts. Off-road use of motorcycles is another common source of annoyance where the police and local authorities are often powerless to act. Even when successful prosecutions are brought against offenders, MACCANC says "the likelihood is that the level of

the resulting fine will be derisory." Among the report's recommendations:—

- A simple, practical "use" noise test procedure for motorcycles is required, which could be incorporated in the annual MOT test.
- Motorcycle "use" noise legislation should facilitate effective enforcement of machine noise control.
- Realistic penalties should be imposed for offences involving motorcycle noise.
- All organised motorcycle events should require prior notification to Local Authorities who should have due regard for environmental noise aspects of the activity.

The report has the backing of the National Society for Clean Air. The NSCA's Noise Committee is concerned about the effects of noise from motor vehicles, and is taking a particular interest

in the motorcycle issue. NSCA Secretary General John Langston said "We welcome the MACCANC report as a considerable advance in the debate over motorcycle noise control. There is mounting public concern over noisy motorbikes; every Environmental Health Department and Police Authority in the country should be looking at this report."

* *"Motorcycle Noise Legislation and Regulation – a Critique"* Available from MACCANC, Environmental Health & Consumer Protection Dept, City of Manchester, Town Hall, Manchester. Price £5.00 post free.

NOISE FROM NEIGHBOURS

One of the most common causes of complaint in housing is hearing the unwanted sound of other people's activities – noise from neighbours. The way noise is transmitted from one house to another and practical solutions for both house conversions and new build are explained in 'Noise from Neighbours', a new video learning package. Produced by a Building Research Establishment team and based on BRE research, the 30-minute video is aimed at both the building designer and the constructor. It will also be of particular benefit to local authorities and housing associations challenged by sound insulation problems in conversions and new build. Building students and building professionals will also find the package of value.

The video starts with a simple, well illustrated explanation of the basic principles of sound insulation. The second part, on house conversion, describes the design options for improving the insulation of walls and floors, discusses correct detailing, and compares

the sound insulation that popular designs can be expected to provide. The final part deals with new building and covers the general design principles for optimising sound insulation and hints on good site practice. The package also includes an introduction to the video, and BRE publications on sound insulation within the building envelope: four Information Papers, four Digests, three Defect Action Sheets and a booklet containing the video commentary. The complete package costs £60 (+ £9 VAT) from Publications Sales, Building Research Establishment, Garston, Watford WD2 7JR.

On the same subject, an excellent report from Avon, Gloucester and Somerset Environmental Monitoring Committee looks at the response of local authorities to neighbourhood noise complaints. They say that all local councils should have a policy stating how they treat complaints. The policy should be backed up by a common set of procedures so that complainants are satisfied and council resources used effectively. Examples of standard letters and useful background information are also given.

Recognising the importance of the Neighbourhood Noise issue, the NSCA Noise Committee is to set up a Working Group to tackle the subject. Preliminary scoping work will take place over the summer; the Group are keen to look at the approaches adopted by local authorities to neighbourhood noise, with a view to identifying existing good practice and areas where more information is needed.

* *Answers to Domestic Noise Nuisance Problems; available from R Rogers, Wansdyke DC, Environmental Health Services, High St, Midsomer Norton, Bath BA3 2DP, price £8.50 inc p+p.*

TRAFFIC NOISE CALCULATION

A new memorandum on the calculation of noise from road traffic has been issued by the DTp. The procedures described must be used in the assessment of entitlement under the Noise Insulation Regulations, and also provide guidance for more general applications such as environmental appraisal, highway design and land use planning.

* *Calculation of Road Traffic Noise*; HMSO, £6.80.

CONTAMINATED LAND

With the current concern about landfill-gas, and recurring scare stories about asbestos dumps, the DOE has issued a leaflet reminding us of the role of the Interdepartmental Committee on the Redevelopment of Contaminated Land. ICRCL can give advice on BSI-agreed best practice and help with liaison between the many different bodies which have expertise or an interest in the re-use of contaminated land. Guidance notes on specific types of site are available; contact ICRCL, DOE, Room A342, Romney House, 43 Marsham Street, London SW1P 3PY.

GREEN CONSUMERS WOODED

Manufacturers and retailers are realising that an environmentally-responsible image can bring considerable marketing advantages. In the last few months 'Clean Air' has received an increasing number of press releases for products which claim environmental acceptability as a major selling point. Several of the more 'up-market' supermarket chains have now removed CFCs from own-brand aerosol products. Sainsburys are going

one step further and using CFC alternatives in their refrigeration systems. Tesco are converting their vehicle fleet to run on unleaded petrol. There are ecologically-sound unit trusts available, and an Ecology Building Society to invest in. A new book — "Green Pages" — on the emerging green economy advances the claim that environmental conservation makes for good business. Details are given of a number of ventures which are making money out of concern for the environment.

Clearly market research has uncovered the need to appeal to a small, but growing sector of the public with 'Green' sensibilities. Cynics suggest that this is simply another marketing ploy; some companies have been criticised for promoting a clean image whilst continuing to cause unacceptable pollution, or produce dangerous products. Many other industries and services will find no competitive advantage in pursuing such a path. Consumer pressure seems unlikely to have a major effect on environmental impact, except in certain well-defined markets. Often the most environmentally-responsible attitude is simply to consume **less** — energy, materials, goods, or whatever; an attitude unlikely to find favour with most industries. Nevertheless, the moves to woo the Green Consumer are to be welcomed; public consciousness is raised, and the environmental deeds of some companies may be compared with their brave words. To promote the concept, a Green Consumer Week has been declared for 12th-18th September. It will be interesting to see who jumps aboard the bandwagon.

* *Green Pages — the Business of Saving the World*; John Elkington, Routledge, £14.95

THIRD H.W.I. REPORT

The Hazardous Waste Inspectorate, now part of Her Majesty's Inspectorate of Pollution, has published its third report.* The report addresses several issues of importance and finds that although there have been some improvements in the waste disposal industry there is still need for much greater professionalism and training. It draws attention to the fact that, in England, only 23 waste disposal plans have been submitted leaving 52 still awaited. This contrasts with Wales where 36 out of 37 have been completed. It questions the value of a handful of the plans prepared by individual waste disposal authorities over a period of eight years and thus lacking any common approach. The Inspectorate calls for the early completion of outstanding plans and for future waste disposal planning to be organised on a regional basis.

The report also questions the performance of the successor waste disposal authorities in some of the former Metropolitan County areas. The Inspectorate illustrates its doubts with examples of the duplication of effort, inconsistency of disposal site licensing, inspection and enforcement standards which it has identified in South Yorkshire and the West Midlands, and argues that this is having a detrimental effect on waste management. On landfill gas, the report draws attention to the generally inadequate conditions for gas monitoring and control contained in most landfill site licences. It argues against the redevelopment of landfill sites for housing or other occupied developments. The report also comments on the poor standards found by the Inspectorate in NHS hospital incinerators and argues that Crown immunity should not be an excuse for low standards of operation.

In April 1987 the HWI was incorporated into Her Majesty's Inspectorate of Pollution (HMIP) together with the Industrial Air Pollution Inspectorate, the Radiochemical Inspectorate and a new water pollution control function. This report is the final one to be released by the Inspectorate as a separate body and is concerned with the standards of waste management for the year ending 31 March 1987. HMIP will, in future, publish reports on its activities as a whole.

* *The Hazardous Waste Inspectorate – Third Report*; HMSO, £7.60

CFC CONTROLS INADEQUATE

The Stratospheric Ozone Review Group, established to advise the DOE on ozone depletion, now recommends that emissions of chlorofluorocarbons (CFCs) must be reduced much further than the levels required by the 1987 Montreal Protocol. The Group conclude that since their first report last year firm evidence has emerged of significant depletion of the ozone layer as a result of man's activities. They say that it is now virtually certain that the so-called Antarctic hole is caused by CFCs which are also implicated in ozone depletion over other parts of the globe, including the UK. Unless emissions are greatly reduced more severe depletion of stratospheric ozone is likely to occur. CFCs are also thought to be significant contributors to the greenhouse effect.

Assuming enough countries ratify the Montreal Protocol, it should enter into force at the beginning of 1989. The existing provisions are for a 50% reduction in the production of the most damaging CFCs, but these measures will be reviewed in 1990.

ACID LAKES CAN RECOVER

A report prepared for the DOE by University College London suggests that some ecosystems could recover relatively quickly from the effects of acid rain, once deposition rates are reduced. By studying the sediments of upland lakes, researchers can build up a picture of the timing, extent and causes of lake acidification. In some areas acidification was accelerated by the planting of coniferous trees, or by deep ploughing prior to afforestation. However, the report notes that "Acid deposition has been declining in Scotland over approximately the last fifteen years. Already the uppermost sediments of some lochs show evidence of slight improvement. These data indicate that a large reduction in acid deposition is likely to lead to a rapid response in lake chemistry and biota."

* *Lake Acidification in the UK; Battarbee et al, ENSIS Publishing, £8.00*

RENEWABLES REPORT

Renewable energy sources could provide nearly 30% of current UK electricity demand by 2025, according to a new report from the Department of Energy. Windfarms, tidal barrages, energy from wastes, passive solar design and geothermal power seem to be the favoured technologies. At £15m, the annual R&D budget for renewables remains relatively small, and it is clear that there will be no tax incentives or grants to encourage the uptake of new technologies. The only exception is for farmers; in an attempt to encourage diversification, the Ministry of Agriculture is offering grants to farmers who install renewable energy systems. Electricity can be sold back to the national grid as an extra source of

income; upland farmers are particularly well placed to take advantage of the wind and water resources in their areas.

Meanwhile, in Sweden, a different approach to energy policy is evident. A £40m 5-year electricity conservation programme has been announced, renewable energy and combined heat and power will be developed, and nuclear power will be phased out — the first two reactors will be taken out of service by 1996. Similarly, Denmark will develop 100MW of wind turbines and 50-100 small CHP/district heating schemes, all fired by domestic fuels such as natural gas, woodchip, biogas and straw. As an additional clean air spin-off, field burning of straw will be banned from 1990.

* *Renewable Energy in the UK: The Way Forward; HMSO, £4.95*

COMBUSTION PLANTS DIRECTIVE

Agreement has been reached on the EC Large Combustion Plants Directive. The UK finally bent to European pressure and has agreed to cut the output of SO₂, compared to 1980 levels, in three stages with a 20% reduction by 1993, 40% by 1998 and 60% by 2003. NO_x emissions will fall 15% by 1993 and 30% by 1998. The British government was keen to remove any uncertainty over its commitment to pollution prevention measures in the run-up to the privatisation of the CEGB; EC pundits consider that this enabled the Commission to prise more concessions from the UK, where the Department of Energy has lobbied strongly against further cuts in emissions. In an attempt to bring further pressure to bear, The Commons Environment Committee issued its report on air pollution two days before the EC Environment

Ministers met to discuss the Directive. As yet there has been no word from the CEEB about how the emission cuts will be achieved.

The Ministers have also agreed the second stage emission limits for small cars (below 1.4 litres). They will have to meet the same standards as those for medium cars, from 1992 for new models and 1993 for all new vehicles. The limits are 30g per test for CO, 8g for NO_x and hydrocarbons combined.

Erratum:

In the last edition of Clean Air we reported some statistics from the DOE Digest of Environmental Protection No. 10. A diligent reader telephoned to point out that the figure for NO_x emissions (p40) for 1986 should have been 1.94 million tonnes, not 1.94 thousand. This goes to show (a) that Clean Air is very closely read, and (b) that the DOE is fallible — we repeated the error from one of their own press releases!

INDUSTRIAL NEWS

LSS MOVES ON

London Scientific Services will be moving from their base at County Hall following their takeover on October 1st by specialist engineers Rendels Ltd. The move will ensure continuity of LSS services to a wide range of customers, including local authorities and the London Fire Brigade.

LSS Air Pollution Group is responsible for the co-ordination of the London Air Pollution Monitoring Network, sponsored by 14 London Boroughs. The second LAPMN report, summarising results for 1987, is now available from LSS. The findings show that WHO guideline values for CO, NO₂ and SO₂ are often exceeded in the capital, and NO₂ levels in central London continue to show an upward trend. However EC limit values for lead and SO₂ were not exceeded.

PRIVATE POWER PLANS

Thames Power, a consortium formed by Taylor Woodrow, BICC and Schroders, have announced plans to enter the electricity generation market following privatisation. Their first 990MW power plant, to be sited at Barking Reach in Essex, is planned to use natural gas and combined cycle technology. A number of environmental studies, including the effects of noise and flue gas emissions, have already been commissioned, and the plant could be operational by 1993. A 290MW gas-powered combined heat and

power station is also to be developed in Leicester by Leicester Energy Ltd. Both schemes have received approval from the Department of Energy; gas is a premium fuel and special permission is necessary before it can be used for electricity generation.

'SAFE' CLINGFILM

Recent worries about the dangers of plasticisers in food overwrapping film have resulted in the development of alternative products. SMC Packaging of Telford, Shropshire are marketing 'Environmental Film' which they claim contains no plasticisers, and is entirely pollution free, even when burned after use. Draft EEC legislation recommends that food overwrapping film should not be used if it contains plasticisers able to migrate more than 10 mg per dm².

NEW PROCESS FOR PHURNACITE

The troubled Coal Products Phurnacite plant at Aberdare is to replace one of its coke batteries with medium heat treatment plant in an attempt to reduce the high levels of pollution for which the plant has become notorious. Coal Products say that if the MHT process works well the other three Disticoke batteries could also be replaced with MHT, which is cheaper than the alternative Ancit system.

DRAEGER TAKES ON MSI

Draeger Limited, the specialist industrial safety and medical equipment company, has announced the acquisition of M.S.I. (Measuring Systems Industrial) by its parent company Drägerwerk AG of Lubeck, West Germany. As a result of the acquisition, Draeger Limited will

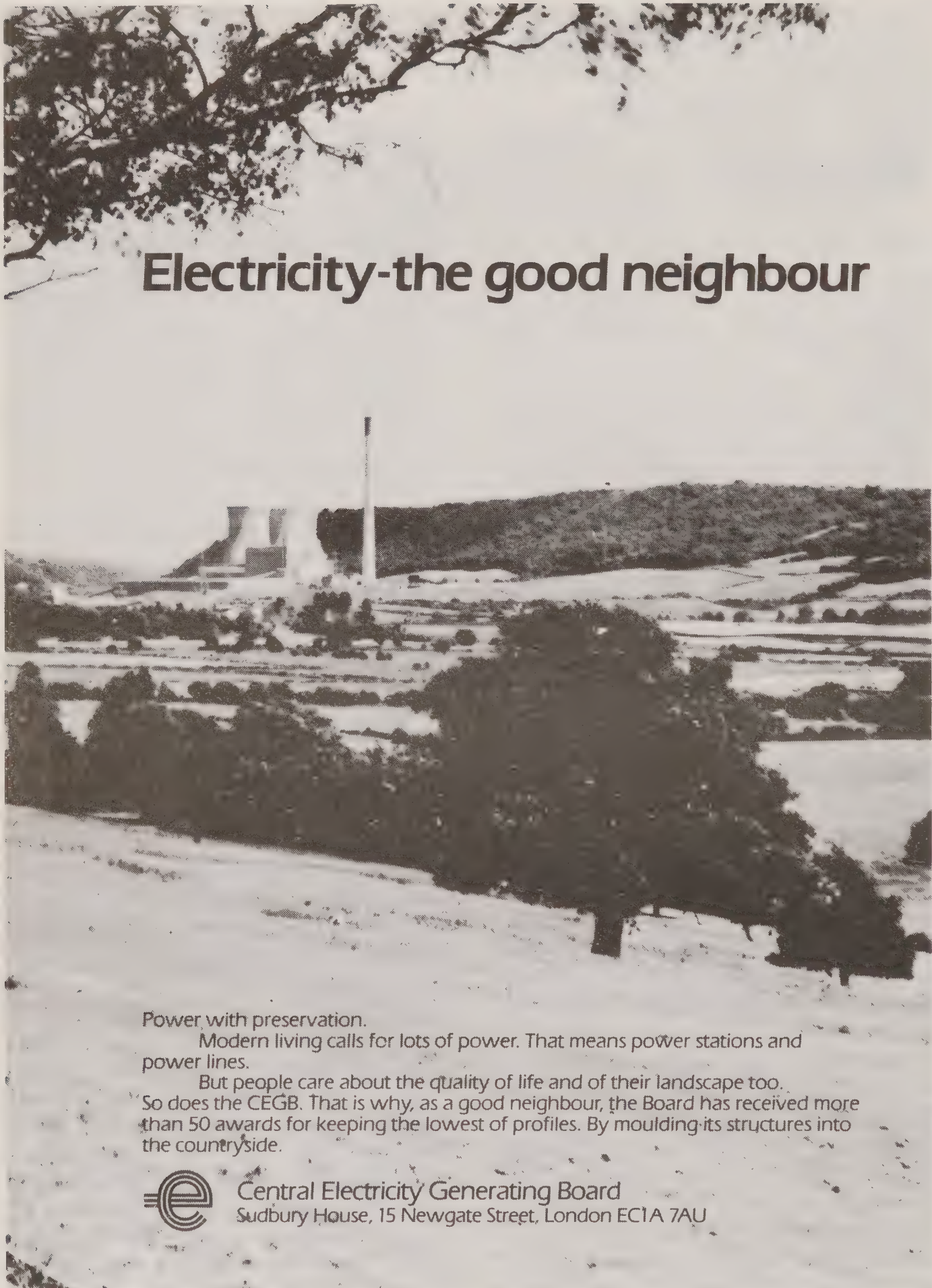
now be responsible for the sales and service of the M.S.I. range of stack gas analysers in the U.K.

The 2000 and 2500 models combine the latest electronics and sensor technologies to provide a computerised multi-function gas testing instrument and data printer integrated into a compact, portable unit. This enables the user to measure and record gas concentrations in many locations with a single instrument. M.S.I. equipment has a wide range of applications in environmental protection, technical monitoring and servicing in chemical plants, process technology, heating and power generation.

NEW FBC SYSTEM FOR ICI

A £6 million fluid bed boiler which will burn low quality coal, together with scrap plastic and packaging materials and other low cost fuels has been developed at the ICI Film Group's factory in Dumfries. ICI said that the decision to use coal as the main energy source for the future at Dumfries was based on the knowledge that "the technology employed within the boiler plant will ensure that the site's energy needs will be met with cost effectiveness through the next decade and beyond. Particularly pleasing is the combination of the multi-fuel capability and the local environmental benefits."

The re-circulating fluidised bed boiler plant is the latest in coal-fired technology, and represents a "new generation" of coal fired plant. More efficient and capable of meeting new high standards of emission control, the recirculating bed could become the work-horse for coal-fired private power generation.



Electricity-the good neighbour

Power with preservation.

Modern living calls for lots of power. That means power stations and power lines.

But people care about the quality of life and of their landscape too. So does the CEGB. That is why, as a good neighbour, the Board has received more than 50 awards for keeping the lowest of profiles. By moulding its structures into the countryside.



Central Electricity Generating Board
Sudbury House, 15 Newgate Street, London EC1A 7AU

ACID RAIN GAS SENSORS AWARD

By nearly quadrupling its exports of advanced gas sensors to Europe over the last two years, City Technology Limited has won the 1988 Queen's Award for Export. One of the factors leading to the increase by three hundred and fifty five per cent in City Technology's European exports has been the continent's widely publicised concern with acid rain. City Technology's sensors monitor and identify the specific gases, allowing preventive action to be taken.

The company, wholly owned by London's City University, designs, develops and manufactures the gas sensors, which use electrochemical technology. A company of only some 80 people, it was nevertheless described in a recent, authoritative Frost & Sullivan report as 'The most significant manufacturer of electrochemical gas sensors in Western Europe and the major cause behind this sector's rapid growth.' Sensors are manufactured for oxygen, carbon monoxide, hydrogen sulphide, sulphur dioxide, nitric oxide, nitrogen dioxide, chlorine and hydrogen. Hydrochloric and hydrocyanic acid sensors are under development. All employ techniques found in fuel cells, experience of which the company and the University gained when collaborating with the US space programme.

GAS NEW COMPETITOR FOR COAL

Home-produced coal faces a new challenge from natural gas for producing electricity, according to Lord Marshall, Chairman of the Central Electricity Generating Board. Gas would join low cost imported coal as a big competitor for British Coal's market for power

station fuel, he told the annual conference of the Union of Democratic Mineworkers in Weymouth. Until recently, there had been an EEC directive that in general gas should not be burnt to produce electricity, and there were strong arguments to 'save it'. That law was likely to change next year. Starting from 1989, it would be quite legal to burn gas to produce electricity. The process was very economical in terms of thermal efficiency. "So I would like to stress that the main challenge to the future of domestic coal comes from low cost imported coal and also now from the availability of natural gas for burning in power stations," he said.

REFRIGERANTS ADVICE

The Heating and Ventilation Contractors Association (HVCA) has produced a code of conduct, aimed at refrigeration engineers, to encourage the careful use of CFCs. The Montreal Protocol has agreed to limit production and use of many CFCs, including refrigerants R11, R12 and to some extent R502, together with C113, C114, C115 and halons 1211, 1301 (13b1) and 2402.

HVCA says that it fully supports the international initiative to implement the protocol in a realistic and responsible manner. It will participate in discussions about development of alternative refrigerants and of equipment which matches them. It welcomes research and development of effective replacements as fast as possible within the constraints of proper toxicity and compatibility testing.

Heating and Ventilation
Contractors' Association
34 Palace Court, London W2 4JG
Phone: 01-229 2488

NSCA NEWS

STRAW & STUBBLE BURNING

Figures for the third NSCA survey of straw and stubble burning reveal an overall reduction in the amount of burning for the 1986 season. Reports from over 160 local authorities show that, whilst neither 1985 or 1986 equalled the widespread problems which caused such an outcry in 1983, there are still many trouble-spots where burning and smoke nuisance are as intense as ever. The adoption of model byelaws seems to have improved the safety of the burn, with fewer fires reported out of control, but complaints about smoke or smut nuisance remain at a high level. The weather, of course, plays an important role; recent poor summers have apparently dampened enthusiasm for burning. NSCA will be monitoring the 1988 burning season and would welcome feedback, particularly in the unlikely event of a hot, dry summer. Copies of the survey are available from NSCA.

MOTORCYCLE NOISE INITIATIVE

Pioneering work carried out by David Romaine of Derby City Council and the NSCA Noise Committee has shown that a static noise test can be used to distinguish between a 'noisy' motorcycle and one silenced to acceptable standards. A new report, summarising data collected in Derby and at the British Motorcycle Federation's annual rally in Peterborough, shows that 95% of all motorcycles with standard silencers in good

condition produce noise levels of less than 100 dB(A) using a standard test procedure. Conversely, a very large percentage of motorcycles fitted with non-standard exhausts exceed the 100 dB(A) level.

These results are significant — they could open the way to more effective controls on motorcycle noise. It would be possible by use of Section 97 of the Construction & Use Regulations 1986 to enforce the 100 dB(A) level as the maximum permitted for any road motorcycle. There are indications from both the Police and the BMF that they would support the introduction of this standard. Such a move would effectively eliminate the large proportion of motorcycles fitted with non-standard silencers — the machines which cause annoyance and offence to the public at large. NSCA will be lobbying hard to have a test of this nature adopted and enforced.

** A Static Noise Test for Motor Cycles; from NSCA, £2.95.*

NSCA TARGETS CROWN IMMUNITY

Hospital incinerators, and other combustion plant based on Crown Premises are effectively immune from prosecution under the Clean Air and Control of Pollution Acts. Often sited in smoke free zones, they represent a major loophole in air pollution control, much to the frustration of many local environmental health departments. NSCA has launched a campaign to bring Crown premises into the regulatory net. A survey is underway to determine the extent of the problem, and NSCA is looking for support from other bodies who share this policy objective. Evidence of the seriousness of the issue comes from the 3rd report of

the Hazardous Waste Inspectorate, published in June. HWI visited fifteen hospital incinerators and commented "... the situation is deplorable. Those seen operate to standards which would not be permitted by a similar operation in the private sector unprotected by Crown Immunity."

NORTHERN DIVISION

54 delegates attended the Spring meeting and 27 apologies for absence were received. Vice Chancellor Dr. F.G.T. Holliday a former member of the Flowers Commission welcomed the delegates to Durham University and in his welcoming remarks emphasised the need for obtaining scientific information on any subject but that the use of that information must have people in mind. Local authorities need to be equipped by the best information to have a more authoritative voice in these problems because of the impact on the people that they serve and the people who are yet to be born.

The first speaker for the afternoon Dr. G. Holland in his paper entitled "Radio-active nuclides in the Environment — an introduction" reminded the audience that the Chernobyl accident in 1986 had caused widespread public concern, it amply demonstrated that nuclear accidents, however distant, can spread their radio-active pollution over a very wide area. It also demonstrated how ill prepared government was for such an accident and unable to respond coherently to the public's demand for detailed and informed advice. What must never be forgotten is that the effect of this incident and previous accidents, together with weapon testing for more than 30 years, it still with us, and, because of the persistent nature of many radio-active nuclides, and their half lives,

will remain with us well into the next century. Each accident adds to the level of contamination in the soil, in the sea, on the beaches and in living plants and animals. What is required is an accurate monitoring programme to be developed, because radiation monitoring cannot discriminate between the different sources of radiation you require more than a geiger counter, it needs a more sophisticated application of gamma-ray spectrometry.

Dr. Leat gave an absorbing talk on Analysis of Environmental Samples by Gamma-Ray Spectrometry; his explanation of this sophisticated technique was done in a manner which allowed all delegates to feel that they understood this work. Dr. Haywood outlined the problems that have occurred since the early 1940s and the detonation of the first nuclear device, this being man's contribution to the radio nuclide budget of his environment. The problem with all of these situations is not simply in direct proportion to the magnitude of the radio-active releases but is related to the extent by which existing environmental levels are topped up. Therefore any routine monitoring programme must have a strategy which is designed to establish both spatial and temporal trends.

Because soils and sediments both act as sinks for a large variety of radioisotopes they are the most useful indicators for this work of monitoring, and would form an integral part of a programme developed to embrace the whole of the Northern region. Professor Evans gave a paper on "Why monitor radio-activity levels in plants and animals". In developing his thesis, he demonstrated that the major routes by which people are exposed to radionuclides are by eating contaminated foods or drinking contam-

inated water. Food plants acquire radio-isotopes both from the soil in which they are grown and from radio-active particles or contaminated rain landing on their leaves. Because most of this is incorporated into the living plant tissue and cannot be removed by washing and until accurate prediction is possible of radio-isotope levels in food, plants and animals, monitoring of foods sold for human consumption is absolutely necessary, such monitoring to embrace imported and food grown locally.

In conclusion Dr. Holland explained the workings of DUERMU: Durham University Environmental Radiation Monitoring Unit and outlined a partnership scheme which could be offered to the members of the Northern Division, this partnership would allow the exclusive use of their facilities and expert staff to undertake a course of regional monitoring tailored to the needs of the member authorities. Outline training of individual members of Council staffs would be given in the techniques of gamma-ray spectrometry, from sampling, through preparation to analysis thereby enabling Councils to be closely involved in the programme and keep the public more fully informed. This is an interesting concept and it is to be hoped that all members of the Northern Division will give a commitment to it for the next three years.

Councillor L. Poole, invited comments and questions from the floor and were received and dealt with by the speakers, and in closing Councillor Poole thanked Dr. Holland and all his staff for the most interesting afternoon that the Division had had and in doing so he wished it to be known he thought the Vice Chancellor should be proud of the people working in his department being of such a high

calibre. He then asked the members to show their appreciation in the usual manner.

EAST MIDLANDS DIVISION

More than fifty delegates assembled at the Civic Theatre, Corby, on Thursday 14th April, 1988 when our hosts for the day were the Corby District Council. Following coffee and biscuits on arrival the meeting commenced at 10.30 am with Councillor R.S. Chamberlain JP in the chair. Before commencing the proceedings Councillor Chamberlain referred to the deaths of Rear Admiral P.G. Sharp, the former Secretary General, Mr. T. Henry Turner and Councillor W.R. Cashmore, both former Chairmen of the Division, and Mrs. Penny Gilbert of the Headquarters Staff. Delegates stood for a time in silence in memory of those mentioned.

Councillor Chamberlain then introduced Councillor Jack Adamson, Vice Chairman of Corby District Council who extended a Civic Welcome to the delegates. Councillor Adamson reminded delegates of the amount of air pollution formerly experienced in Corby during the steel making era. This had now gone completely and the way in which Corby had recovered would be the subject of Councillor Mawdsley's talk later in the proceedings. In the afternoon there would be an opportunity to see the Industrial Heritage Centre and Craft Workshops and also some of the new industrial sites.

The Chairman then introduced Councillor W. Mawdsley, Deputy Leader of the Corby District Council, who spoke about Corby's long and fascinating history. Councillor Mawdsley answered questions at the conclusion of his talk which was

warmly applauded by those present. This concluded the morning session and members then partook of an excellent lunch by kind invitation of the Chairman and Members of Corby District Council. At the conclusion of the meal the Honorary Secretary expressed the thanks of the Division to Councillor Adamson for his Civic Welcome, to Councillor Mawdsley for the able and interesting way in which he had held his audience for an hour without visual aids, to the Corby District Council both for their hospitality and for acting as hosts for the day, to Mr. J. Sharnock, the Chief Environmental Health Officer and his staff for all the arrangements, and to all who had been involved in any way in the days proceedings. The vote of thanks included the arrangements for the visits yet to be made in the afternoon.

After lunch delegates were taken by coach on a tour of the many new industrial undertakings which have replaced the steel works and were also able to visit the Industrial Heritage Centre and Craft Workshops. In the latter by models, photography, videos, re-creation of scenes from the 1930's, and preservation of some of the machinery and equipment used in the steel works the story of Corby as a steel making town has been preserved in a most interesting way. At the conclusion of the visit delegates returned to the Civic Theatre for light refreshments before dispersing. The Division is again indebted to Corby for a most interesting and successful day.

LONDON, SOUTH EAST AND CENTRAL SOUTHERN DIVISION

The 33rd AGM was held at County Hall, London, on Tuesday, June 14th by kind permission of London Scientific Services. Some 20 delegates and members

attended. Owing to ill health, Mrs P Naylor, Chairperson 1987/88 has had to resign the Chair.

The new Chairperson, Mr A Rees thanked Mrs P Naylor for her services rendered to the division in the Chair over the past five years and welcomed her remaining on the Committee. A cordial welcome was also extended to Cllr L Solkhon, D Corfield, Dr J Godfrey and P Legge as new Committee members.

After the AGM, Dr M J Schwar addressed the meeting on the work and activities of the London Scientific Services which from October 1st 1988 will become part of Rendels Ltd, a member of the High Point Group which specializes in professional engineering and management services to the public.

SOUTH WEST DIVISION

Divisional Meeting held on Thursday 21 April 1988 on the subject of Chlorofluorocarbons

A Divisional Council meeting was held in the morning and the Council were very pleased to welcome the Secretary General of the Society to this meeting. After the business of the morning, Air Commodore John Langston presented a very interesting address to the Division. He spoke briefly of the role and work of the Society and more recent areas of concern in the various pollution fields. Particularly however, he referred to the issue of global changes and the need for increased diligence in pollution control, not only locally but on a national and international scale.

After being entertained to lunch by the Chairman of Northavon District Council the Divisional Council was then joined by another 30 members of the Division to attend the afternoon meeting on the

subject of CFCs and Ozone. The first speaker was Stephen Pearce of Avon County Council who explained the chemistry of CFCs, their advantages, disadvantages, uses, and briefly discussed alternative chemicals. He also spoke of environmental sampling methods and analytical techniques. The second speaker was Mr Chris Mullis of ISC Chemicals in Avonmouth. Mr Mullis high-lighted the problems of early refrigerants which led to the invention of CFCs by Thomas Midgeley. He discussed the uses of CFCs and pointed out that many personal hygiene products do not use these CFCs and many other aerosols use a mixture of hydrocarbons and CFCs. He commented on the loss of 7½ million dollars to the CFC industry in the United States as a result of public pressure. CFCs are about half the price of other propellants and Mr Mullis indicated that it takes five years to carry out toxicity tests on new compounds and this requires 50 tons of the product to be manufactured. Consequently the search for alternatives is very expensive. The final speaker in the afternoon was Brian Price, an Environmentalist and member of the Society. Mr Price described the properties of the ozone layer and explained the "hole". He referred to the greenhouse effect and possible contribution by methane and CFCs, together with other pollutants. He put forward the case that many products with CFCs such as foamed plastic containers should be replaced with, for example, paper alternatives. CFCs in old refrigerators should be recovered and re-used and he felt that the Montreal protocol does not go far enough. He commended to the meeting the Friends of the Earth suggestion to freeze current levels of CFC production and ban the dispersive use of the product in a similar way to the ban in recent years

on PCBs.

After the meeting an active and stimulating discussion which was opened by Air Commodore John Langston. During the discussion problems of inadequate labelling of 'ozone friendly' aerosols was discussed together with the safety and flammability of alternative products. The meeting was well attended and I am sure that many members present found the points raised by the speakers enlightening and several local authority members present were hoping to persuade their Councils to impose a ban on the use of CFC containing products where alternatives are available.

SOUTH AND MID WALES DIVISION

Since last year's AGM there have been two general meetings of the Division. The first meeting took the form of a visit to Warren Spring Laboratory for which the Division hired a coach. The trip was well attended, even though the journey took most of the morning. In the afternoon, delegates were addressed by Dr M Williams from Warren Spring and saw several research projects. The second meeting was a one-day event organised in conjunction with Wimpey Laboratories Ltd. Here I must express my thanks to Mr John Evans for all his assistance. Delegates were addressed by various speakers from Wimpey Laboratories and Local Authorities on EIA; Contaminated Land, and Radiation. The meeting was well attended and all delegates expressed their pleasure in being able to attend such an excellent meeting.

During the year, a planned programme of Divisional Council Meetings was put into effect. The meetings were planned to meet in the week prior to a full council meeting at National level. This meant

that our representatives to the Council of the Society could present any views expressed by Divisional Council. In addition, the representative on the various committees reported back to Divisional Council the events occurring at

Society's meetings. This two-way exchange of information has enabled Divisional Council to be kept fully informed and also the Division's views could be made known at National Council.

LEAD-FREE FEEDBACK

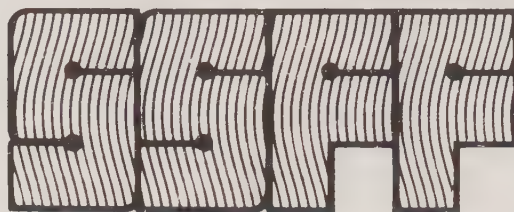
We asked for readers' experiences in converting their cars to unleaded petrol, and drew a mixed response. On the whole, most had converted relatively easily; the necessary adjustments being made during servicing, and often at no cost. Older cars proved more of a problem — one garage initially quoted £20 for a conversion, and then phoned back with a revised quote of £250! Another example given was of someone offered a choice of three new company cars, none of which would run on unleaded. Some environmentally-aware companies and local authorities have an unleaded policy for their vehicle fleets, but there is clearly room for improvement here. In case any readers need to have their consciences pricked further, one correspondent wrote "... I am an Environmental Health Officer, and strongly believe that professionals in the Air Pollution field should practice what they preach. How can anyone maintain their credibility in asking for various controls, legislation, etc, if they do not?"

On a similar subject we know of someone, buying a new BMW from a dealer, who was offered a version with or without an exhaust gas catalytic converter. Sadly, the dealer seemed to have no idea what it was for.

PENNY GILBERT

It is with the deepest regret that we report the death of Mrs. Penny Gilbert — the Society's Editor. She died on March 30th, having become seriously ill at Christmas. Joining the staff of the Society in 1981 as Assistant to the Editor, she was appointed Assistant Editor in 1985, Information Officer in February 1987 and Editor/Librarian the following July. A graduate of York University and also holding a diploma in teaching, Penny was ever concerned in improving her knowledge in the work of the Society while using her natural skills to great effect in transferring the issues to the written word. While she preferred to work quietly behind the scenes her pleasing personality, delightful sense of humour, discretion and sound judgement made her ever popular with her colleagues on the staff and the many members whom she met at Conferences and Workshops. She will be deeply missed. A loving and devoted wife, we offer our profound sympathies to her husband William and her family.

SOLID SMOKELESS

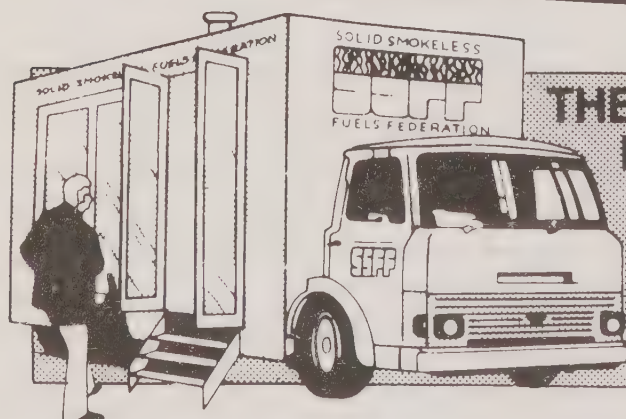
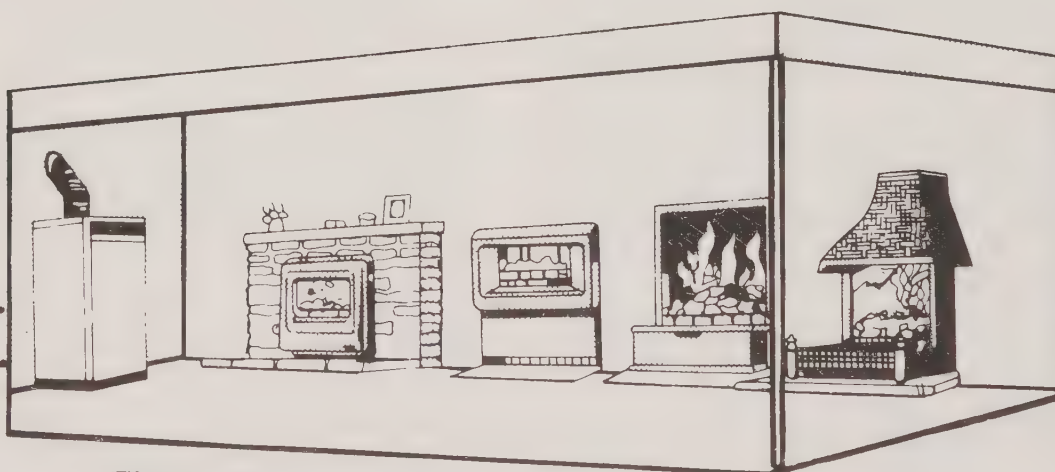


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FUTURE EVENTS

5–8 SEPTEMBER – Conference: Healthy Buildings 88

Organisers: Swedish Council for Building Research

Venue: Stockholm, Sweden

Details: SCB, PO Box 6911, S-10239 Stockholm, Sweden

8 SEPTEMBER – Symposium: NO_x Generation & Control in Boiler & Furnace Plant

Organisers: Institute of Energy (South Coast Branch)

Venue: Southsea, Hants

Details: Dr. J.S. Hardman, 0705 827681 x224

12–13 SEPTEMBER – Conference: Transport of Hazardous Materials

Organisers: IBC Technical Services

Venue: Gloucester Hotel, London

Details: IBC 01 236 4080

19–21 SEPTEMBER – Seminar: Sanitary Landfilling

Organisers: International Solid Wastes & Public Cleansing Association

Venue: Amsterdam

Details: ENVIRO Amsterdam, (Tel) 020-5491212

20–21 SEPTEMBER – Symposium: Furnaces 88

Organisers: Contract Heat Treatment Association

Venue: Albany Hotel, Birmingham

Details: Furnaces 88, 0737 768611

20–23 SEPTEMBER – Symposium: Ventilation 88

Organisers: British Occupational Hygiene Society

Venue: Imperial College London

Details: BOHS 01 486 4860

22 SEPTEMBER – Conference: Radon Exposure in the UK

Organisers: Sheffield City Council

Venue: Octagon Centre, Sheffield

Details: SCC Health & Consumer Services, 1 Barkers Pool, Sheffield S1 1EN

25–27 SEPTEMBER – Seminar: Managing the Environmental Impact of Onshore Oil & Gas Activities

Organisers: Centre for Environmental Management & Planning

Venue: University of York

Details: CEMP, 0224 272480



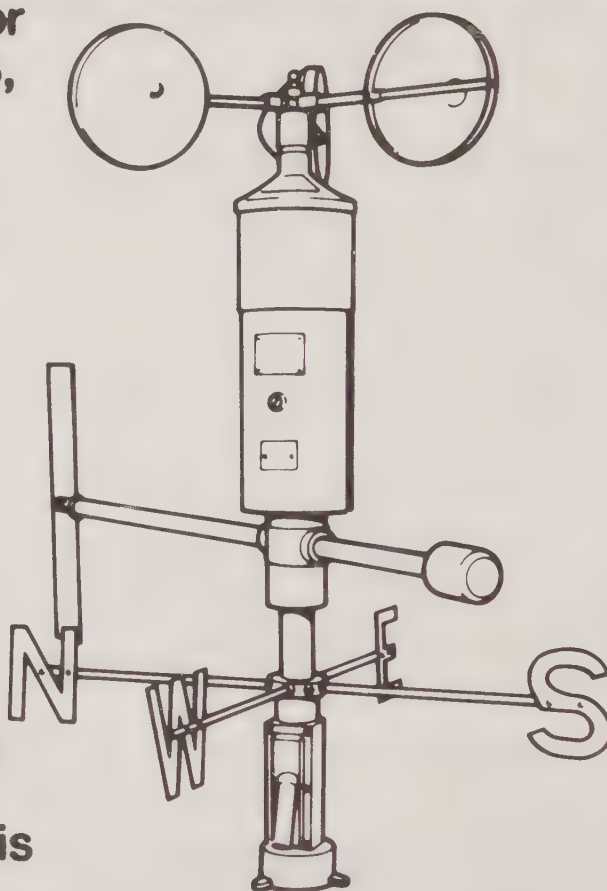
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26–28 SEPTEMBER – Workshop: Environmental Dispute Resolution*Organisers:* Environmental Resources Ltd*Venue:* Cambridge University*Details:* ERL 01 486 1211**27–29 SEPTEMBER – Conference: Envirossoft 88 (Computer Techniques for Environmental Studies)***Organisers:* Computational Mechanics Institute*Venue:* Porto Carras, Greece*Details:* CMI, 042 129 3223**29 SEPTEMBER – Seminar: Air Pollution Law in the 1990s***Organisers:* IBC Legal Studies & Services Ltd*Venue:* Imperial College London*Details:* IBC 01 236 4080**4–7 OCTOBER – Conference: Landfill Gas & Anaerobic Digestion of Solid Waste***Organisers:* Department of Energy*Venue:* Abbotswell Hotel, Chester*Details:* Mrs G A Cole, ETSU, 0235 24141 x3467**24–27 OCTOBER – 55th Clean Air Conference and Exhibition***Organisers:* National Society for Clean Air*Venue:* Canolfan Aberconwy, Llandudno*Details:* NSCA, 0273 26313**7–10 NOVEMBER – Congress: Climate and Development***Organisers:* United Nations CSTD*Venue:* Congress Centrum Hamburg*Details:* Hamburg Messe und Congress, Postfach 302480, D-2000 Hamburg 36, West Germany**15–18 NOVEMBER – Course: Industrial Noise – Prevention of Damage to Hearing***Organisers:* Loughborough University*Venue:* Loughborough University*Details:* Pat Stonehouse 0509 222161**22–24 NOVEMBER – Workshop: EEC Air Quality Directives & the Harmonisation of their Implementation in the Member States***Organisers:* EC Commission*Venue:* Lyon, France*Details:* M. Bonhoure, IIGGE, BP 128, 73101 Aix-les-Bains Cedex France**25–27 NOVEMBER – Conference: Noise In & Around Buildings***Organisers:* Institute of Acoustics*Venue:* Windermere Hydro*Details:* IoA, 25 Chambers St, Edinburgh EH1 1HU

ANNOUNCEMENT
from
MONODRAUGHT FLUES LIMITED

In the November edition of 'Clean Air' volume 17 No 3/4 an Article was published by Dr D J Hall of the Pollution Abatement Division of the Warren Spring Laboratory titled:—

**"Air Pollution Aspects
of Room-Sealed Boiler Flue Systems"**

Monodraught Flues Limited, whose vertical balanced-flue chimney system maybe described as a "room sealed boiler flue system", wish to make it clear that their system, will, when properly installed and sited and of the required height, comply with the requirements of the Clean Air Act as set out in the Memorandum on Chimney Heights. Indeed this vertical balanced flue arrangement provides considerable advantages in meeting the requirements of the Memorandum on Chimney Heights for commercial gas-fired boiler plant in the range of 150-2MW output.

The ventilation aspects of the Monodraught system referred to in Dr Hall's Paper is now to be covered by Amendment No 1 to British Standard BS 6644 which classifies the Monodraught system as a Balanced Compartment Installation, in providing ventilation and combustion air solely from high level openings to an otherwise closed compartment.

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BOOK REVIEWS

THE HOLE IN THE SKY

Man's Threat to the Ozone Layer

by John Gibbin. *Publishers: Corgi. Price: £3.95. ISBN: 0-552-99329-8*

"The hole in the sky is now the size of the United States and the depth of Mount Everest." Thus spake NASA scientists of today's environmental bogeyman, the great gash in the ozone layer over Antarctica. John Gibbin in this compelling book, peels away the mysteries of the atmosphere, including the greenhouse effect, with speed and skill; the urgency of the situation force-fed by the pace of his writing.

Identifying the causes behind the destruction of the ozone layer, the author then examines the effects of its further deterioration: increased skin cancer, cataracts and other diseases, the blighting of food crops, the harming of animals, and the tumultuous upheaval of the world's climate and life-support systems. Wiping away in one fell swoop, the feeble excuses launched to gainsay the seriousness of the situation, this report rams home the dangers of complacency and inertia amongst world politicians and calls for united action now to prevent planetary crisis. Gripping reading, even for the most laid-back layman!

RADON AND ITS DECAY PRODUCTS IN INDOOR AIR

Edited by William W. Nazaroff and Anthony V. Nero, Jr. *Publishers: John Wiley & Sons 1988. ISBN: 0-471-62810-7*

Radon as an indoor air pollutant represents one of the most critical issues in environmental health today. This publication is the first comprehensive survey on the incidence, effects and control of indoor radon, and provides an authoritative, wide-ranging and technically rigorous account of the nature and behaviour of its decay products, health effects and strategies for minimising exposure. Each chapter has been written by a leading expert and provides significant new insights. Recommended specialist reading; there are plenty of charts, graphs and diagrams to illustrate the text.

ACID RAIN AND BRITAIN'S NATURAL ECOSYSTEMS

Contributions to a conference held at Imperial College of Science and Technology

Edited by Mike Ashmore, Nigel Bell and Cathy Garretty. *Publishers: Imperial College Centre for Environmental Technology, 1988. Price: £8.00. ISBN: 0 950 7744 6 4*

Much of the air pollution produced in Britain is not transported overseas but is deposited here. The effect of this pollution on British wildlife is a matter of increasing concern and this book provides a unique summary of the current state of knowledge and opinion in this area.

AIR POLLUTION CONTROL TECHNOLOGY

by **B. Bretschneider and J. Kurfurst.** *Publishers: Elsevier Science Publishers, Amsterdam, 1987. ISBN: 0-444-98985-4*

This publication deals with the formation of industrial emissions and the technical methods and measures to limit them. The principal industrial sources of atmospheric pollution and the technological conditions for the formation of solid and gaseous substances in emissions are defined. Technical principles, basic processes and apparatus employed to limit and eliminate solid and gaseous pollutants are described along with production technology which can bring about a considerable decrease in atmospheric pollutants. In a broader sense, information is provided on the harmful properties of substances contained in emissions from industrial sources, and their effect on the population of fauna and flora, soil, structures and materials. There is also an economic evaluation of atmospheric pollution and the resultant harmful effects.

Aimed primarily at workers in the field of environmental protection, this book offers an appraisal of the complex technical capabilities available to alleviate the very serious problems encountered in keeping the atmosphere pollution free.

THE EARTH REPORT

Monitoring the Battle for our Environment

General Editors: Edward Goldsmith and Nicholas Hildyard. *Publishers: Mitchell Beazley 1988. Price: £7.95. ISBN: 0-85533-670-6 Pb, 0-85533-695-1 Hb*

An up-to-date survey and evaluation of current environmental issues, this report is an excellent introduction to the effects man is having on his environment. Eminent writers set the scene, highlighted by boldly illustrated plans, maps and diagrams in eye-catching red and black, on such problems as acid rain and forest-decline, the politics of food aid, nuclear power after Chernobyl, and the purity of drinking water. Questions raised and points not understood in the main text can be researched further by delving into an extensive A-Z directory which offers a comprehensive coverage of environmental flash-points.

Whatever your interests in environmental issues may be, you will surely find an answer in this superb report. Not all doom and gloom, any pinpricks of hope in the murky miasma of planet pollution are greedily snatched as rays of light for the future.

VEHICLE EMISSIONS AND THEIR IMPACT ON EUROPEAN AIR QUALITY

Proceedings of the Institution of Mechanical Engineers' International Conference 1987-1988. *Publishers: Mechanical Engineering Publications Ltd. ISBN: 0-85298-6327. Price: £38.00 (UK) £48.00 (export)*

Records the proceedings of a conference organised by the Institution of Mechanical Engineers which discussed present European regulations governing emissions of gaseous pollutants and their impact on car and engine developments.

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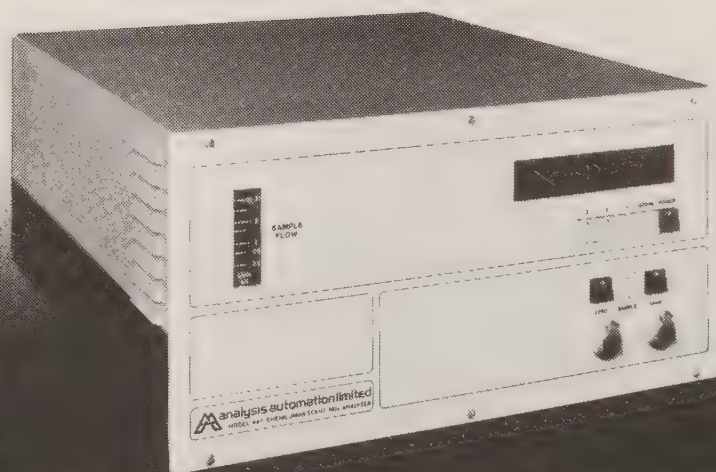
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CLEAN AIR

NATIONAL SOCIETY FOR CLEAN AIR

VOL.18 NO.3
AUTUMN 1988

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NATIONAL SOCIETY FOR CLEAN AIR
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Registered Charity, Number 221026

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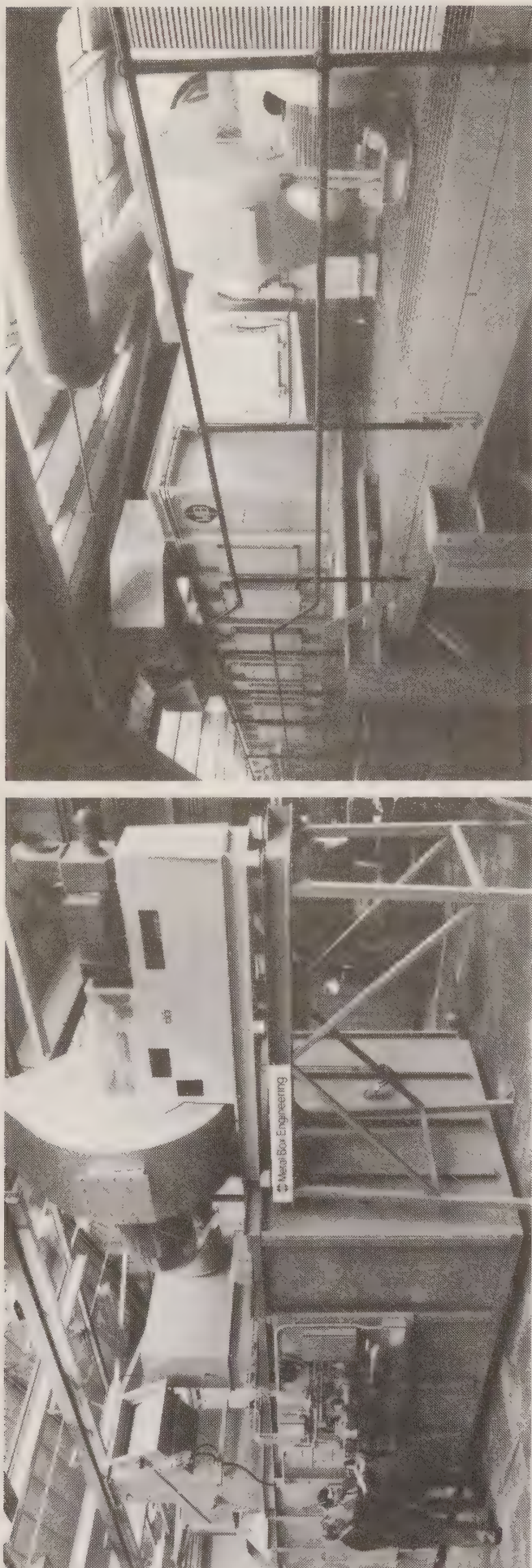
28 Maes-y-celyn, Griffithstown, Pontypool, Gwent

EDITORIAL

THE ROAD TO DAMASCUS

The emergence of Margaret Thatcher as a new champion of the environment has been seen by many commentators as a conversion nothing short of the miraculous. Rightly or wrongly, her image has been one of intolerance towards environmental concerns, and the Government's consistent foot-dragging on EEC and UK environmental legislation has been legendary. Yet the signs of a greenward swing have been apparent since the beginning of the year; UK concessions have been made on most European issues including the Large Combustion Plants Directive, vehicle emissions, and the North Sea. What has made the difference? Politics are seldom straightforward but it might just be that, as a scientist, Mrs Thatcher has been persuaded that the degree of certainty about acid rain, ozone depletion and global warming now demands immediate action. A series of environmental disaster stories has heightened public concern, and all parties are now chasing the green vote. Furthermore the proposed privatisation of the CEGB and of the Water Industry requires a clarification of the pollution responsibilities which shareholders will be asked to shoulder.

There will now be understandable demands for the Prime Minister to provide the essential resources, and one opportunity arises immediately. The DoE Consultation Paper on Integrated Pollution Control (IPC) shows a welcome understanding of the interdependence of ecosystems and the need for integrated control strategies to replace the fragmented system we have today. But, as the NSCA response outlined in this edition of Clean Air makes clear, the Government will have to go much further than the limited steps proposed in the IPC paper. Controls on processes are important, but there is still no mechanism for determining the BPEO for *policy*. One way of meeting this need which is gaining support is the establishment of some kind of 'environmental protection agency' which could co-ordinate the environmental aspects of government policy, now scattered through several ministries. Whilst it is perhaps too much to hope that such a provision could be included in the "Green Bill" which is now being rumoured, such a measure must surely come. In the meantime, all we ask is that HMIP get the significant increase in resources they deserve, and that the long-promised air pollution legislation is finally found a parliamentary slot. Surely any sincerely "green" Prime Minister could accede to that?



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REPORTS

COMMUNITY RESPONSE TO NEIGHBOURHOOD NOISE

by

W.A. Utley and E.C. Keighley

Building Research Establishment

INTRODUCTION

The Building Research Establishment is currently undertaking a major programme of research on behalf of the Department of the Environment to investigate disturbance caused by neighbourhood noise. Two approaches have been adopted to identify the disturbed population, a study of actual complaints and the use of an omnibus questionnaire survey with initial filter questions. A number of in-depth interviews have also been carried out to provide more detailed information about sources of disturbance and how the noise affects people.

The results of the research which are described in this paper provide information about the sources of disturbance including their location and times when disturbance occurs. The possible effect of other variables such as dwelling type, region of the country and demographic factors has been examined. Measures adopted by those affected, to try to reduce the disturbance, are described and their success is assessed. The possibility that there may be particular groups of the general population which are more likely to suffer this type of disturbance is examined.

Data sets

Environmental Health Officers investigate complaints about noise in order to determine whether a nuisance has occurred and therefore whether action should be taken under the Control of Pollution Act to abate the nuisance.

Because EHOs do not use a standard data sheet when investigating complaints and do not always record all the information required for research it was necessary to design a data sheet which would provide this information. A set of guidance notes were produced to assist with completion of the data sheets and to ensure that a consistent approach was adopted.

Data sheets were provided to EHOs on a voluntary basis after assistance had been sought through a letter in *Environmental Health*, the *Journal of the Institution of Environmental Health Officers* and publicity in BRE's *News of Construction Research* and the *Institute of Acoustics Bulletin*. Over a period of two years (mid 1984 – mid 1986) 2,128 completed data sheets were obtained from 47 Local Authorities. The Local Authorities were well distributed over Great Britain.

The omnibus questionnaire survey covered a representative sample of 4,886 respondents drawn by means of multi-stage random sampling from the adult population of England, Wales and the Scottish mainland. The interviews were carried out in-home with one respondent per dwelling during November 1985.

Respondents were initially asked whether they heard or were bothered by five types of environmental noise – that from aircraft, trains, road traffic, neighbours and other people nearby. All those who said that they heard noise from neighbours or other people nearby were asked further questions about specific kinds of neighbourhood noise and about actions to reduce it. Finally information was obtained about the type of dwelling and its age and about the respondents.

Responses to the omnibus questionnaire were used to identify a number of people who were bothered by neighbour noise and who had agreed to further interview. Thirty-one respondents were given semi-structured interviews by trained senior interviewers covering four broad areas of interest; noise sources, the effects of noise on respondents, action to control noise and changes over time.

Results

(a) Sources

Two thirds of all complaints were about noise from music (34%) or barking dogs (33%). A sub-division of the former showed that record player/hi-fi (28%), amplified music (27%) and music (17%) were mentioned most frequently. Parties formed only 10% of the music category. All other types of source were much less frequent with only domestic activities (9%) and voices (6%) having more than 5% of the total.

The omnibus survey showed that noise from neighbours is now the most widespread source of disturbance. Ten per cent of respondents were bothered by noise from neighbours and 8% by noise from other people nearby. This can be compared with 10% bothered by road traffic noise and 7% by aircraft noise. When all those bothered either by noise from neighbours or other people nearby (referred to here as neighbourhood noise) are considered, the total is 15% of respondents.

Table 1 shows the proportion of respondents in the omnibus survey who hear and are bothered by a number of specific sources. It will be seen that Radio/TV/Hi-fi is high both on the list of noises which bother and the list of noises causing complaint. There are, however, a number of major differences between the important sources for bother and for complaints. People's voices are the most widespread source of bother but give rise to relatively few complaints. In part this appears to be due to the fact that the voices that disturb are more likely to be elsewhere than in a neighbour's house or garden. When the responses to those who only hear neighbour's

Table 1: The proportion of the total sample of respondents who hear, and are bothered by the specific kinds of neighbour noise listed.

Specific noises	Hear f	Bother f	Hear %	Bother %	Bother/Hear %
Peoples' voices	819	264	17	5	32
Children	648	170	13	3	26
Neighbours' vehicles	615	185	13	4	30
Radio/TV/Hi-fi	595	244	12	5	41
Doors banging	476	181	10	4	38
DIY	412	160	8	3	39
Animals	359	134	7	3	37
Lawn mowers	298	31	6	1	10
Footsteps	249	62	5	1	25
Domestic appliances	236	24	5	1	10
'Other' noises	193	83	4	2	44
Total mentions	4,897	1,538		Base: 4886	
Number of respondents	1,792	789			

noise are compared to those who only hear noise from other people nearby it is found that a higher proportion of the latter group are bothered by voices than of the former. The effect is even greater with noise from neighbours' vehicles where three times as many of those who only hear noise from other people nearby are bothered as are those who only hear neighbour noise. Noise from animals appears to be less important in terms of bother than it is for complaints.

(b) Source position and time of disturbance

In 93% of cases of complaint about amplified music, the source was situated inside the dwelling. However, barking dogs were twice as likely to be outside the neighbour's dwelling as inside. In the omnibus questionnaire respondents were asked for any noise which bothered them whether they heard the noise direct through the party wall or floor. Again there was a difference between noise from Radio/TV/Hi-fi (80% through party wall/floor) and the noise from animals (49%). The figure of 62% for people's voices provided a further indication that a substantial proportion of disturbance arises when this source is outside the dwelling.

The various sources also showed different patterns when the disturbance was examined in terms of the time of day when it occurred. Noise from Radio/TV/Hi-fi (amplified music) was most likely to cause disturbance in the evening and at night. Noise from animals seemed to cause similar disturbance at all times although for complaints about barking dogs the percentage hearing the noise showed a distinct peak in the daytime. People's voices disturbed most often in the evening and the same pattern was found for complaints about domestic activities and voices. The two studies gave a somewhat different picture of disturbance from vehicle noise. The omnibus survey showed most disturbance from the noise of neighbours' vehicles happens early in the morning, in the evening and at night with low disturbance during the day. The in-depth interviews point to starting of engines (early morning), motor cycles and slamming car doors (evening and night) and car repairs (evening and weekends) as particularly disturbing sources. Most complaints however were about noise from car repairs and this was heard most often during the day and evening.

(c) Type of dwelling

It was found that the type of dwelling in which a person lived had an effect on the relative importance of the various noise sources and also on the likelihood of being disturbed. For detached houses, external sources such as barking dogs and car repairs are more likely to produce complaints than sources usually found inside a dwelling such as amplified music or domestic

activities. The opposite is generally true for flats. The omnibus survey also shows greater disturbance in flats for internal sources. For external sources this survey showed little difference in the probability of disturbance for the different dwelling types.

Overall the complaint data indicated that there were more complaints from people in flats (23% of total) and less from people in detached houses (5%), than would be predicted from the relative proportion of each type of dwelling in the country (12% and 15% respectively). This conclusion was supported by data from the omnibus survey which showed that about 5% of those in detached houses were bothered by noise from neighbours compared to 17.5% of those who lived in flats and an overall figure of 10%.

(d) Demographic factors

Replies to questions about noise in the omnibus survey were cross tabulated against a number of demographic variables in order to determine whether neighbour noise is ubiquitous or tends to be confined to particular sub-groups of the population. A number of factors, sex, household status, working status and socio-economic status were found to have little or no effect on the likelihood of disturbance by neighbour noise. For other factors quite large and statistically significant differences were found.

The age group most likely to be disturbed by neighbourhood noise was 25-34 years and the least likely was the over 65s. Twenty-two per cent of the former were bothered by noise from neighbours and other people nearby compared to 8% of those over 65 and an overall figure of 15%. A similar pattern is found when disturbance caused by particular sources is examined.

However, noise from banging doors and some of the less important sources do not show the peak for the 25-34 age group, while the noise of children bothered most those in the youngest age group of respondents (16-17 years).

It was found that those who rented their property from a local authority were twice as likely to be bothered by neighbourhood noise as those who completely owned their own homes (ie no mortgage). A similar effect was found with the complaint data where equal numbers of complaints were found for owner occupiers and local authority tenants despite there being twice as many owner occupied dwellings as dwellings rented from a local authority.

In the omnibus survey households were classified according to the number of children present in each of the age ranges: 0-2 years, 3-5 years, 6-9 years and 10-15 years. It was found that those with the youngest children are almost twice as likely to be bothered by neighbourhood noise as those with no children. The difference decreases with increasing age of the children

and for those with children older than 9 years there is no difference from those with no children.

(e) Control measures

Residents who heard neighbour noise were asked whether they had felt they would like to reduce the noise. Only 32% answered positively and even amongst those who were bothered by neighbourhood noise only two thirds said that they would like to try to reduce the noise. Furthermore only about 70% of these latter respondents had actually taken any action. The most common action was to complain to the neighbour (61%). A further 20% complained to the local authority or EHO and 13% complained to the police. Whatever action was taken, only a minority considered it completely effective with about half or more considering the action to be ineffective. An exception was those who had tried to improve sound insulation where 59% considered the action partially successful. Even among those who had complained to an Environmental Health Officer only 64% had taken the initial step of complaining to the neighbour.

It appears that there is a distinct reluctance to complain about neighbour noise disturbance. The in-depth interviews showed that the reasons why people did not complain to their neighbours were that it would cause unpleasantness and make matters worse. Those interviewed also pointed out that they would have to live with the consequences. In a few cases respondents were deterred by fears of retaliation or violence. Other respondents felt that a complaint would not have any effect.

DISCUSSION

The results from the studies of neighbourhood noise disturbance enable a picture to be built up of the nature of this disturbance. The most bothersome noises can be divided into four broad categories, electronically produced sounds, vocal sounds, impact sounds (banging doors and footsteps) and animal sounds. Of these categories, vocal sounds and impact sounds are much less likely to lead to complaints to EHOs. In the case of the vocal sounds this is because often the noise was produced in the road or an adjoining open space rather than in an adjoining dwelling. At least half of the respondents were bothered by more than one noise source and even for the complaint data there were 23% more sources than complaints. This supports one of the findings of the in-depth study, that some problems are associated with neighbours who lead noisy lifestyles. With the exception of barking dogs, vocal sounds and noise associated with vehicles the disturbing

noise is situated inside another dwelling. It is not clear to what extent inadequate levels of party wall or floor insulation are a factor in causing disturbance. However, it is known that some dwellings have party wall/floor insulation which is poor.

It is clear from the results that there are demographic sub-groups who are at a higher risk of disturbance from neighbourhood noise and other groups at much lower risk. It cannot be taken for granted that those demographic factors which were found to affect disturbance act independently. It is hoped that an analysis of the data from all five surveys completed between 1985 and 1987 will permit the independent effect of each demographic variable to be determined. Nevertheless the 1985 data are sufficient to allow a contrast to be drawn between a low risk sub-group characterised by one of the upper age groups, no children present, and living in a fully-owned detached property and a high risk group in the younger-to-mid age group, with children, living in an attached property rented from a local authority. It was found that the incidence of bother was seven times higher for the high risk group which had 36% bothered by neighbourhood noise (7% for low risk group) and 38% bothered by specific noises (5.5% for low risk group). The high risk group was also more than twice as likely to be bothered as the sample as a whole.

CONCLUSIONS

A study of noise complaints and an omnibus survey have provided detailed information about disturbance caused by neighbourhood noise. The results of the two studies are in broad agreement and lead to the following conclusions.

1. Noise from neighbours and other people nearby bothers 15% of respondents and is now the most widespread source of noise disturbance ahead of traffic noise (10% bothered) and aircraft noise (7% bothered).
2. Two thirds of complaints to Environmental Health Officers about noise from domestic premises concern amplified music or barking dogs. Other sources cause a similar amount of disturbance but provoke fewer complaints and these include people's and children's voices, banging doors and vehicles. Half of those who are bothered by neighbourhood noise are bothered by more than one specific source.
3. For attached dwellings most disturbing noise originates inside the adjoining dwelling. However, voices and barking dogs are often heard outside the dwelling in gardens, the street or open spaces.

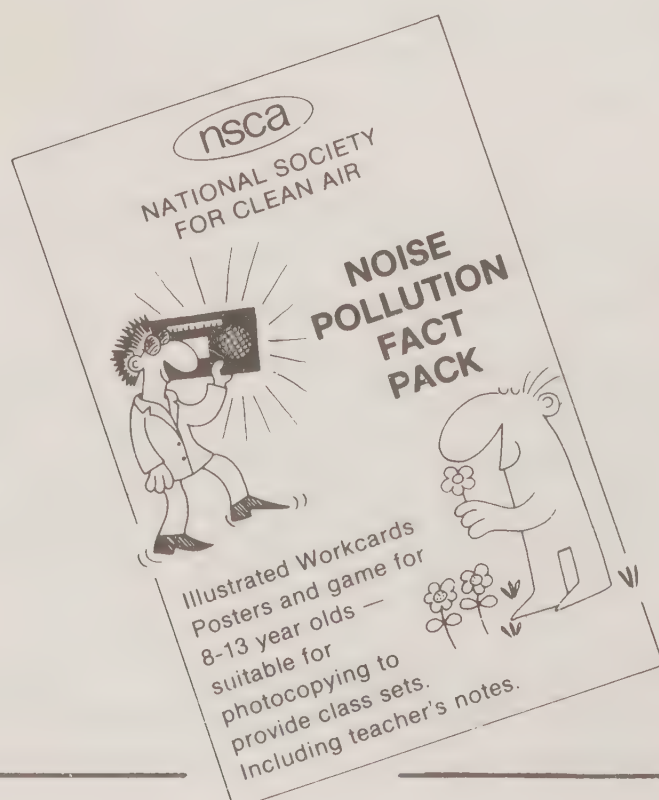
4. The time when noise disturbance is most likely to occur is the evening, particularly 22.00 – 24.00 hours when people are trying to get to sleep.
5. Some demographic factors appear to have a major influence on neighbourhood noise disturbance. It is possible to characterise a high risk group that is seven times more likely to suffer disturbance from neighbourhood noise than a corresponding low risk group.
6. There is a marked reluctance to complain to neighbours about noise. Even among those who had complained to an Environmental Health Officer only 64% had spoken to the neighbour producing the noise. Those who did complain or took other action to reduce the noise generally found such action ineffective in reducing the noise.

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This paper was presented at the 5th International Congress on Noise as a Public Health Problem, Stockholm, 21-25 August 1988.

The NSCA Noise Committee has formed a working group to look at the major sources of neighbourhood noise, with a view to proposing ways in which the problems could be remedied.

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THE EC DIRECTIVE ON MUNICIPAL WASTE INCINERATION AN ENVIRONMENTAL APPROACH

by
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INTRODUCTION

The character of municipal waste has changed remarkably over the past 30 years mainly due to (a) the 1956 Clean Air Act which restricted the use of coal on the open fire, (b) the advent of natural gas in place of coal thus reducing the quantity of domestic coal ash for disposal, (c) the increase in the use of newsprint and (d) the widespread introduction of plastics. As a consequence the calorific values of municipal waste has increased and it is now recognised as a valuable source of energy.

In many European Countries such as Sweden, Germany, Holland and France larger plant is widely used to incinerate municipal waste in one form or another. In the UK we have, at present, ample supplies of oil, natural gas and coal and there is less incentive to take the trouble to burn municipal waste. Ninety per cent of our waste is sent to landfill with little change in the practice used over many decades.

Attention has been drawn by the Department of the Environment to the serious problems with emission of methane from landfill sites which are not properly regulated. At some sites, such as those at Stone (Kent), Aveley (Essex) and Little Packington, the emitted methane has been harnessed for power generation but only a small proportion have adopted this technique. Tightening of controls on landfill sites and increasing difficulties in obtaining suitable sites will result in greater interest in the disposal of domestic waste by incineration.

In considering the incineration of municipal waste for the production of useful energy, either it can be fed directly into specially designed boiler plant or it can be pre-treated to remove fines, metal and other components not suitable for combustion and the resulting refuse derived fuel, RDF, burnt in more conventional boiler plant. Both techniques have been used in Europe and America but serious deposition problems have been encountered in boilers burning either raw refuse or RDF. Attention has also been drawn to serious atmospheric pollution problems.

Extensive research and modifications to plant design have been carried out in America and Europe to overcome these problems. Based on the results of these investigations, the EC have prepared the Council Directive for the minimisation of air pollution from new plants and for the reduction of pollution from existing plants.

THE PROPOSED EC DIRECTIVE

The proposed EC standards were issued by the European Commission at the end of February (1). The objective is to harmonise controls across the EEC by setting standards which can be achieved with proven abatement technology and at a reasonable cost. Two categories are, therefore, proposed. The first imposes emissions limits and design and operating standards which will apply to any *new* municipal waste incinerator for which authorisation is granted after 30.6.89. The second contains transitional provisions to bring *existing* incinerators up to the standards laid down for new plant.

TABLE 1: Proposed EC Emission Limits

	Nominal Capacity	
	5 tonnes/hour or more	Less than 5 tonnes/ hour
	mg/m ³	
Total Dust	50	100
Heavy Metals:		
— Pb + Cr + Cu + Mn	5	5
— Ni + As	1	1
— Cadmium	0.1	0.1
— Mercury	0.1	0.1
Hydrochloric Acid	50	100
Hydrofluoric Acid	2	4
Sulphur Dioxide	300	300
Carbon Monoxide	100	100
Total Organics (as C)	20	20

Expressed at 273° K, 101.3kPa pressure, 11% oxygen or 9% CO₂ and dry gas.

Standards for New Plant

The proposals are for incinerators which burn either raw refuse or RDF. The emissions limits will vary with the size of the plant. They are shown in Table 1.

In addition requirements are also proposed to minimise the formation and emission of dioxins and other trace organics. There must be a residence time of at least 2 seconds at a minimum operating temperature of 850°C with at least 6% oxygen content in the flue gases. The plant must be fitted with auxiliary burners which must be switched on automatically if the operating temperature drops below 850°C.

Details of the frequency of measurements to confirm that the plant is operating within the required standards are also included in the Directive.

Standards for Existing Plant

For existing plant, a slightly different set of size thresholds has been proposed for the interim emission limits. These plants would have to meet a set of less stringent interim requirements by 30 June 1994 and would have to be brought up to the standards set for new plant not later than 30 June 1999.

The interim emission limits for existing plant will restrict only particulate emissions and have been set at 100 mg/m³ for plant with a capacity of 6 tonnes/h or more. In addition, by the same date existing plant will also have to comply with the requirements to minimise the formation and emission of dioxins and other trace organics, with the 100 mg/m³ limit for carbon monoxide and with the fitting of auxiliary burners.

All the UK's incinerators have capacities above 6 tonnes/h and, therefore, other limits for smaller plant are not included in this paper.

APPLICATION OF THE PROPOSED DIRECTIVE IN THE UK

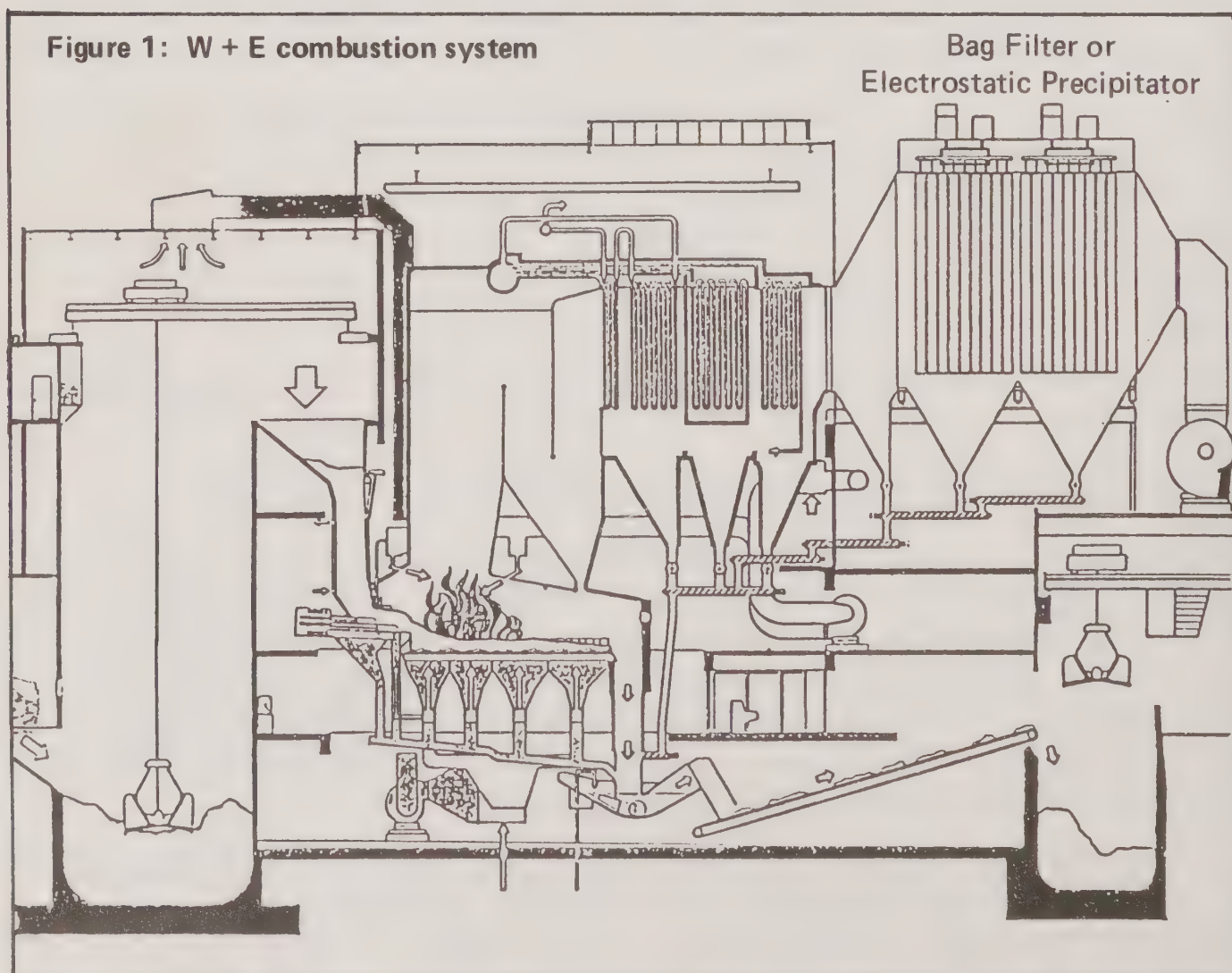
No major new municipal incinerators have been introduced in the UK in the past 15 years. It will, therefore, be advisable to replace the existing plant with new plant by 30 June 1999 as they will have reached or be approaching the end of their useful life rather than attempt to modify them to meet the standards for new plant. Indeed, at some sites it may be considered advisable to replace existing plant with new plant by 30 June 1994 rather than meet the interim limits required by that date.

In studying the Directive proposed by the EC, it is clear that the emission limit values set for new plant with a capacity of 5 tonnes per hour or more will be the major consideration. It is proposed to consider each of the pollutants in turn and the plant designs which would be suitable.

Emission of Dioxins and other trace Organics

In order to minimise emission of dioxins, furans and other trace organics, a minimum operating temperature of 850°C during a residence time of 2 seconds with at least 6% oxygen content of the flue gases is prescribed for new plant. Plant has been designed in Europe to meet these requirements and one such plant (2) was described at the Conference on Engineering for Profit from Waste held in Coventry in March 1988. This plant, Figure 1, has a three pass combustion chamber followed by pendant superheaters, evaporators and economiser with *special mechanical rapping devices* to enable the plant to operate for long periods without fouling problems. Sophisticated combustion control equipment is incorporated. The plant can be fitted with auxiliary burners to be introduced when the temperature of the combustion gases falls below 850°C .

Utilisation of this type of plant will enable the concentration of dioxins, furans and other trace organics to be maintained below the emission limit value.

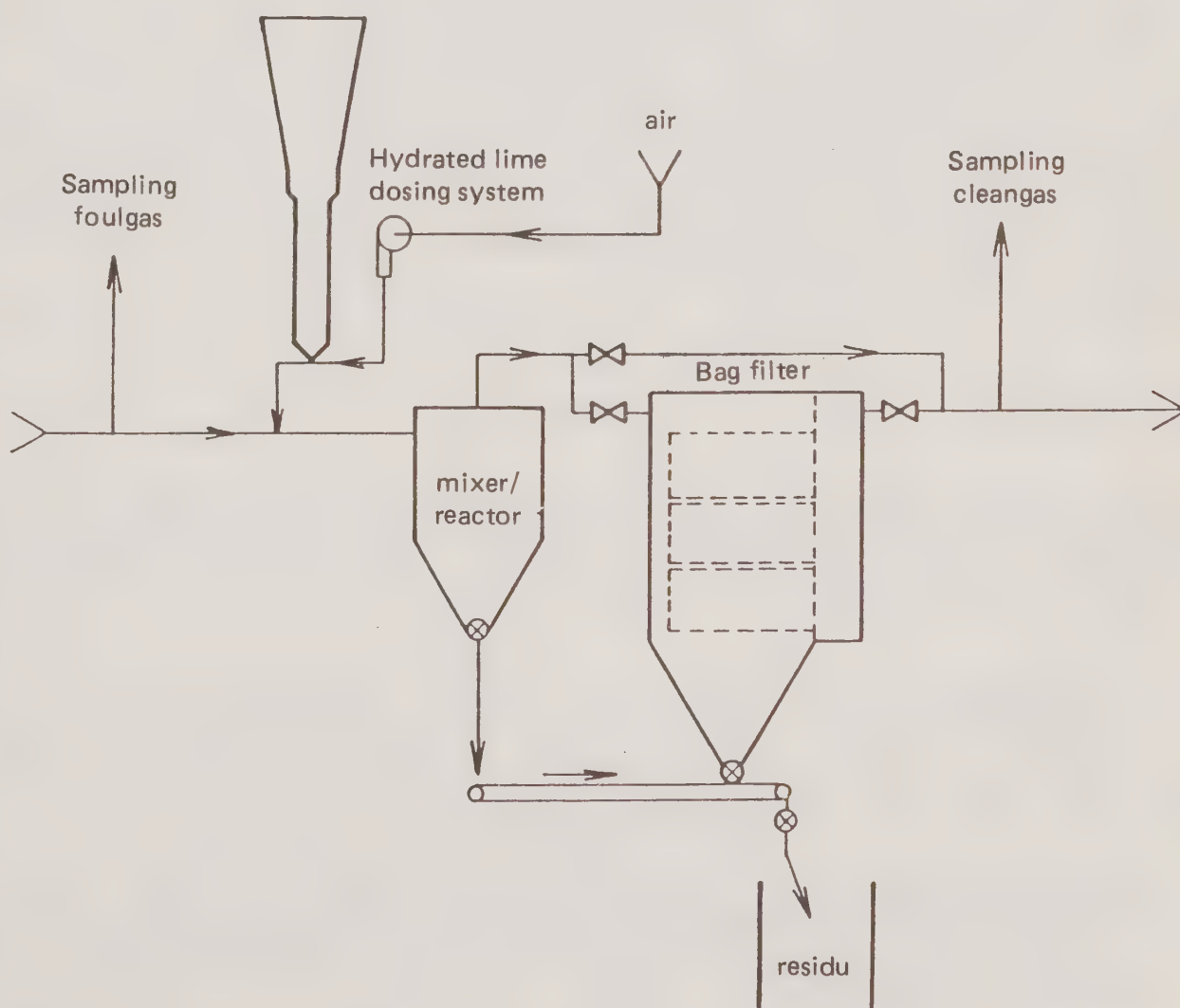


Emission of Dust

The limit value is 50 mg/Nm^3 and can be achieved by fitting a suitable electrostatic precipitator or bag filter plant. These arrestors will also enable the plant to be operated within the emission limit values for heavy metals including cadmium and mercury.

It is possible that there will still be a trace of dioxins in the collected solids and staff who handle the collected dust should wear suitable masks.

Figure 2: Dry scrubbing of flue gases



Emission of Hydrochloric and Hydrofluoric Acids

Mainly due to the presence of plastics in domestic waste, the concentration of hydrochloric and hydrofluoric acids in the flue gases is much higher than in the flue gases from conventional hydrocarbon fuels. Investigations into a dry process (3) for removal of these components from the gas stream by reaction with calcium hydroxide powder have been carried out in Holland. The design of the plant is illustrated in Figure 2 and the effectiveness of active lime is shown in Figure 3. The lime is injected into the flue gases at the exit from the boiler and the gases then pass through a mixing chamber and a bag filter. The treated gas has a concentration of HCl and HF well within the limit value. The concentration of sulphur dioxide is also well within the limit value Table 2.

An alternative method for removing the acidic components in the flue gases is to fit a wet scrubber after the dust arrestors. The flue gases are cooled in the scrubber so that the exit temperature is only 60–70°C. Experience has shown that with low flue gas exit temperatures of this order, the flue gases leaving the chimney may descend instead of rising when the condition known as temperature inversion occurs in the atmosphere. This can cause local problems due to the odour of the flue gases. It is, therefore, necessary with this type of plant to reheat the flue gases to, say, 130°C. Also it is important to ensure that the liquid effluent from the scrubber is treated to avoid environmental pollution problems.

CONCLUSIONS

1. The Technical Committee of the National Society for Clean Air fully supports the introduction of the proposed EC Directive. In addition the Committee considers that
 - a) Operators of bag filters and electrostatic precipitators should wear masks.
 - b) Plant must have a negative draught system.
 - c) If a wet scrubber is fitted, the flue gases must be reheated to ensure that they do not descend locally to ground level and cause a problem due to odour when temperature inversion conditions occur in the vicinity of the plant.
 - d) The liquid effluent from a wet scrubber must be treated to avoid pollution problems.

Figure 3: Removal of HCl and SO₂ as a function of stoichiometry

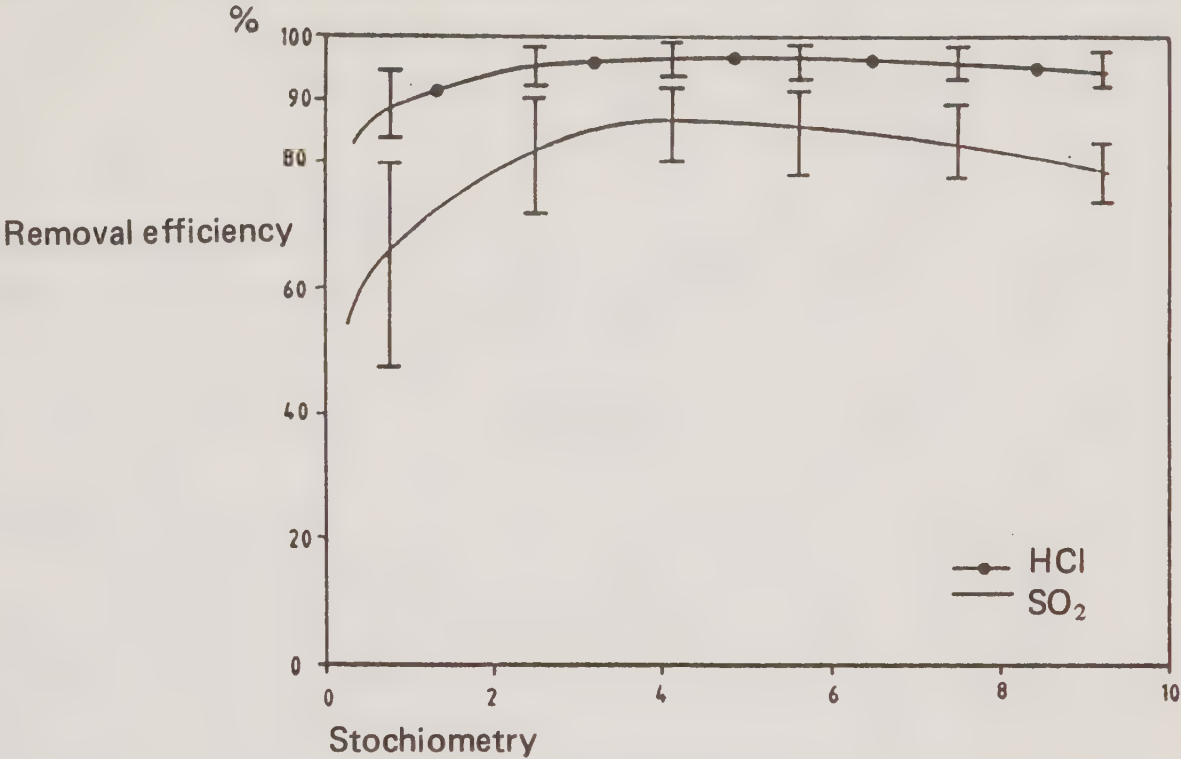


Table 2: Flue gas concentrations and emission standards, concentrations in mg/m₀³

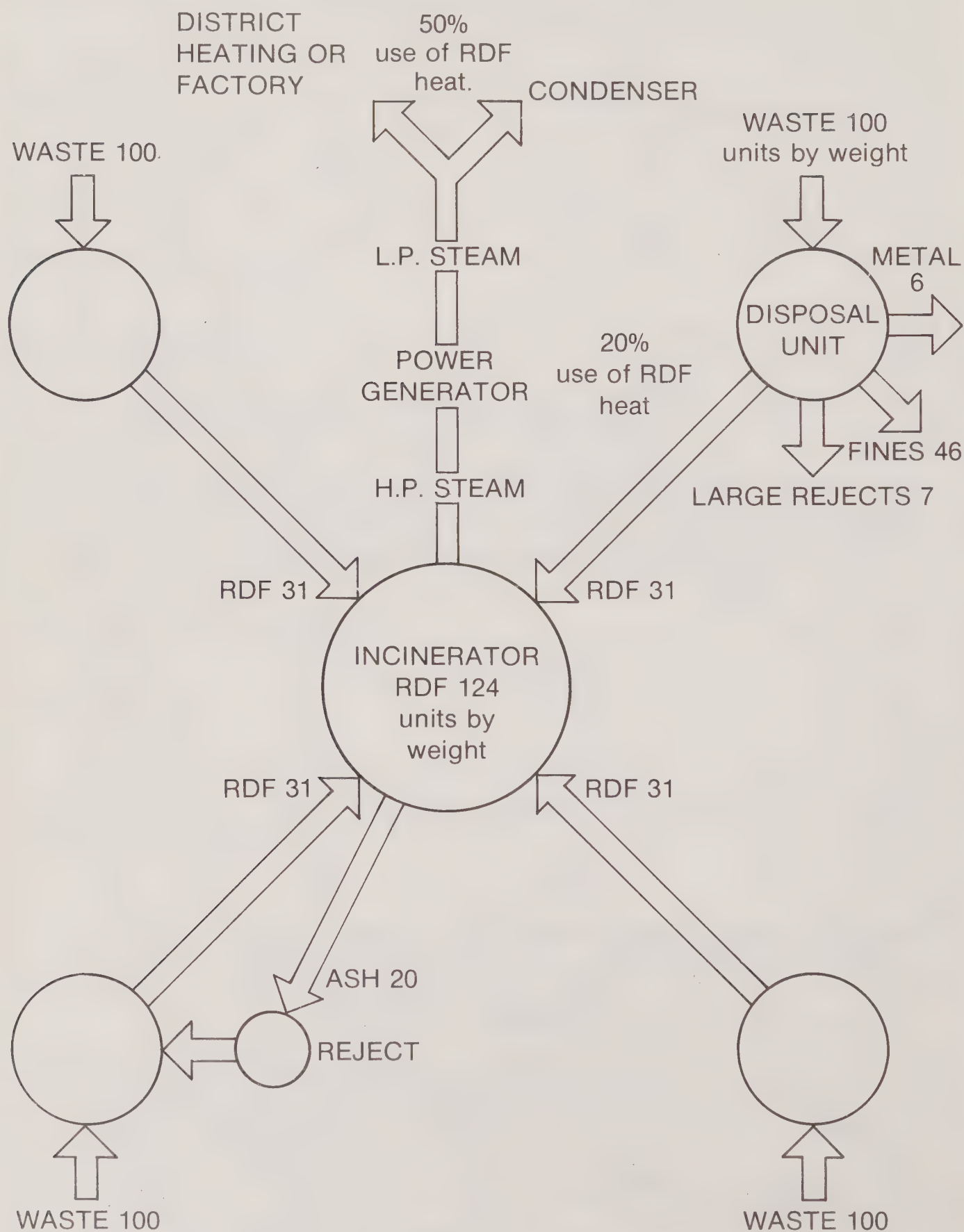
Component	Untreated gas	Treated gas	Standard
HCl	600	20	50
HF	3	0.3	3
SO ₂	140	30	—
Hg	.	.	0.1
Cd	.	.	0.1
Pb + Zn	600	2	5
dust	5000	10	50

Dust and non volatile heavy metals were separated effectively for more than 99.5%. Volatile Hg and Cd were separated for more than 40%.

Removal of heavy metals, concentrations in mg/m₀³

	Cd dust	Cd volatile	Hg dust	Hg volatile
entrance	3.6	0.535	0.125	0.150
exit	0.0037	0.204	0.0003	0.0609
% removal	99.9	45.1	99.7	41.6
% total removal		92.8		68.0

Figure 4: Clean and efficient utilisation of RDF.



2. The new proposed Directive also applies to incinerators which mainly burn refuse derived fuel, RDF. It is unlikely that users of small plant will be able to install and operate economically the necessary equipment required to meet the proposed Directive. It is considered, therefore, that RDF should be incinerated in larger units designed to the necessary standards.
3. To achieve optimum efficiency the incinerators, whether they burn raw waste or RDF, should be located, if possible, so that high pressure steam from the boilers can pass through electric power generators and the emitted low pressure steam used for district heating or in a suitable industrial plant, similar to the system used successfully in Coventry.

If it is decided to use RDF, the fuel need not be prepared on the same site as the incinerator but could be delivered from one or more waste disposal units in the selected town or city (Figure 4). As RDF is a clean and odourless fuel, the incinerators and power generators could be installed in close proximity to a factory where the LP steam could be utilised or close to city offices or a dense housing site where the LP steam could be used in a district heating scheme.

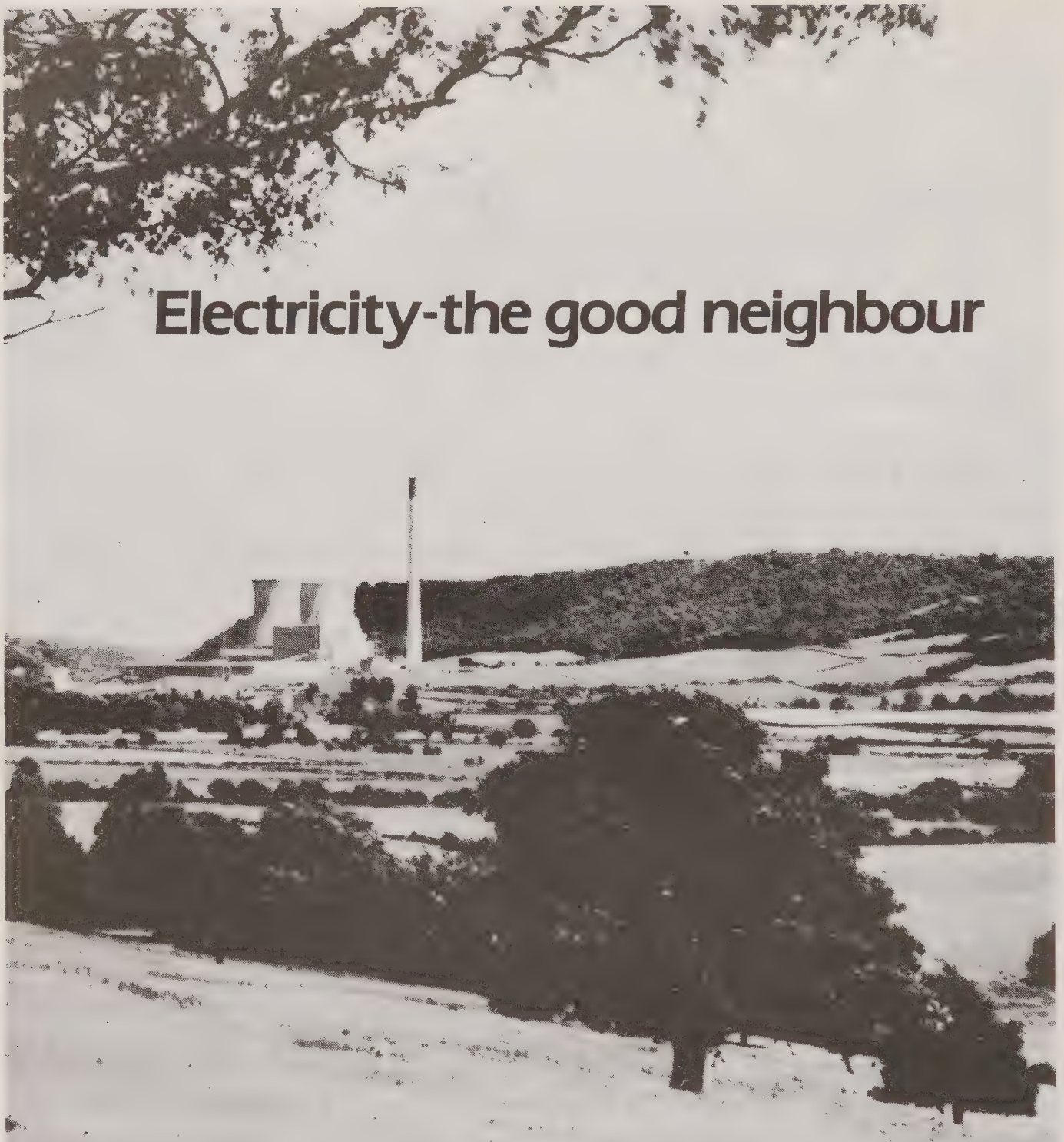
4. Plant, mainly burning bulk waste, which will comply with the proposed Directive has been designed and is operational in Europe but the waste incineration plant at present in use in the UK will not meet the proposed limit values without major modifications. It is suggested that, as a priority, the Government should find a suitable location for the installation of a *prototype waste incineration system*, should fund the installation of a new plant incorporating the latest designs used abroad and should carry out trials to obtain the optimum performance.

This is an opportunity to dispose of our domestic waste effectively and safely with minimal atmospheric pollution and at the same time help to save our finite assets of gas, coal and oil. We should attain the same standards as our co-Europeans and develop the equipment and know-how for use in this country and for participation in a potentially large export business.

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Based on paper presented at the conference of the UK Environmental Law Association on 10 September 1988.



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INTEGRATED POLLUTION CONTROL

In July the Department of the Environment and Welsh Office issued a Consultation Paper on Integrated Pollution Control. Comments were invited by 31 October. Here we give a summary of the Consultation Paper, followed by the NSCA's initial response; this will be finalised following consultations with the NSCA's Technical, and Parliamentary and Local Government Committees, and regional divisions.

SUMMARY OF GOVERNMENT PROPOSALS

The Consultation Paper sets out the case for integrated pollution control (IPC) and seeks views on the mechanism for implementing an integrated system of pollution control for processes prescribed for HMIP jurisdiction and the form of the legislation necessary to give HMIP the necessary statutory powers.

I. The Case for Integration

The UK has a well established preventative and precautionary approach to pollution control. But as grosser forms of pollution are controlled, more insidious problems such as acid rain and ozone damage emerge, the result of unexpected interactions between pollutants.

The Royal Commission on Environmental Pollution put forward the concept of 'best practicable environmental option' (BPEO) for disposal of wastes. BPEO emphasises a 'cross-media' approach. In response to the recommendations of the RCEP and an Efficiency Scrutiny of pollution control the Government agreed to establish a unified pollution inspectorate to put BPEO into practical operation. Her Majesty's Inspectorate of Pollution (HMIP) was established on 1st April 1987.

These proposals relate to one of the two Chief Inspectors under the Director of HMIP, the Chief Inspector responsible for certain non-radioactive discharges to air, to water and for certain aspects of land waste disposal. The other Chief Inspector is responsible for radioactive discharges and disposal of radioactive wastes. The proposals relate only to England and Wales.

The practical benefits of integrated pollution control are:

- a) Improved ability to constrain and reduce pollution as a result of considering waste management from the design stage of a plant, thus ensuring selection of an optimal process.

- b) Reduced burden on industry by providing a 'streamlined' authorisation procedure and allowing industry to view disposal options 'in the round'.
- c) More efficient use of pollution control resources by obviating the need for HMIP to maintain a structure based on regulating discharges to the three media separately.

The Government's intent is not to enlarge substantially the number of processes scheduled for control by HMIP or set more stringent standards, but to create a framework in which control can be applied more effectively.

II. An Integrated Pollution Control System

Key elements will be those used to regulate emissions to air in conformity with EC air pollution directives, to regulate discharges to water in conformity with the proposed approach for 'red list' substances, and to meet all relevant EQOs and standards. These elements would be:

- a) Technology-based control: The Inspectorate would apply an integrated approach to all the polluting emissions of plant operating scheduled processes. HMIP would consider the process technology, discharge abatement techniques and waste disposal methods to be used to ensure the protection of people and the environment alike.
- b) Scheduling: Processes to be subject to IPC would be prescribed by the Secretary of State on the basis of published criteria.
- c) Prior Approval: Operator of a new or modified scheduled process applies to HMIP for authorisation.
- d) HMIP authorisation: sets out conditions necessary to protect people and the environment.
- e) Review of Authorisations: at instigation of either operator or HMIP in event of changes to process, new knowledge of effects of pollutants or new technological developments.
- f) IPC notes: serve the same function as BPM notes.

Criteria for Scheduling:

It is proposed to schedule initially:

- a) Processes listed in Part A of December 1986 paper 'Air Pollution Control in GB: Review and Proposals';
- b) Processes discharging 'red list' substances to water and sewers in significant quantities;
- c) Processes generating large amounts of special waste as defined in the Control of Pollution (Special Wastes) Regulations 1980.

These categories represent minimal changes from the scope of existing controls, but producers of solid wastes would for the first time be liable to

control by HMIP. As a long term aim the Government envisages a single coherent set of criteria derived from toxicity, persistence etc. of a substance and applicable to all three environmental media, to determine which processes are scheduled, but in the short term IPC will be introduced on the basis of the criteria outlined above.

Means for Achieving IPC:

The Government is in favour of retaining the essence of BPM approach in any IPC system. However, in the interests of harmonisation, the Government wants to use the formulation from the EC Directives of 'Best Available Technology Not Entailing Excessive Costs' (BATNEEC).

In determining an application for authorisation HMIP would consider the proposed technology of the plant operating the process, so as to prevent harm to health and the environment, and operation of the process and ancillary matters in accordance with best practice, in the context of all existing standards, ensuring that no existing international, EC or UK standards, including quality standards and limit values, would be breached by any IPC consent.

This would mean HMIP would require use of BATNEEC to prevent emission or discharge of pollutants:

- a) in every case where EC Directives require;
- b) for specified processes or harmful substances discharged to specified environmental media.

HMIP would have to observe relevant quality objectives and conditions required by the new National Rivers Authority (NRA), and have regard to the views of other statutory consultees as appropriate. For water, discharge of 'Red List' substances must be minimised by use of BATNEEC and must not breach the EQO for that substance in receiving water. For almost all other substances it is more appropriate to use the absorptive capacity of the environment and set discharge limits to meet EQOs.

HMIP would develop close working relationships with the other pollution control authorities whose broader responsibilities for environmental quality complement the technological control HMIP would bring to bear on the relatively small number of scheduled processes. The detail of the interface between HMIP and the NRA is an issue which is not yet determined.

HMIP will maintain an effective working relationship with the HSE to ensure that development of IPC does not conflict in any way with controls dealing with risks to health and safety of workers or the public. There are no proposals to extend IPC to processes other than those regulated by HMIP.

III The Legislative Framework

The legal framework favoured by the Government would be based on a residual duty incorporated within a consent. Consent would consist of specific provisions based largely on the technology to be employed and emission limits to be observed, but would incorporate a residual duty to operate the process and carry out all other functions not specified in the consent in accordance with best practice and in a manner that renders any emissions that do occur harmless and inoffensive to people and the environment as a whole.

IV Implementation

- a) *Enforcement* — would cover breach of the specific terms of a consent or its conditions, breach of a residual duty and emergency provisions.
- b) *Information* needs of the Inspectorate — Operators would have to supply information on the process and its relationship with the locality; all of the emission leaving the site and the dispersal path they take; operational data; monitoring information; the anticipated effects of significant emissions.
- c) *Appeals* — made to the Secretary of State against refusal to grant consent, conditions of a consent, or terms of an enforcement notice.
- d) *Public access* to information and third party rights — it is proposed that public registers of consents for discharges to water established under COPA be taken as a model. Applications would be advertised and there would be third party rights to make representations to the Inspectorate about them.
- e) *Charging* — This will follow the 'polluter pays principle'. Charges would cover HMIP's authorisation, inspection and enforcement activities, but not policy advice, research and promotion of good practice. There are at present no plans to introduce incentive charges in the proposed integrated control provisions.
- f) *Transitional arrangements* — existing operators of scheduled processes or holders of consent should be deemed to have integrated consent until review by HMIP. Only applicants for a new or revised consent would go straight to integrated control.

NSCA COMMENTS ON THE CONSULTATION PAPER

"The Government has given high priority to protecting the environment".

Most professionals in the pollution control field would challenge this statement, which opens the Consultation Paper. Certainly from an air pollution perspective, the failure to prioritise new legislation and the reluctance to provide adequate resources for the work of HMIP, would suggest that, at

least until now, the Government's priorities have lain elsewhere. However there is evidence to suggest that an understanding is developing about the interactive nature of our environment, as expressed in the concept of BPEO. Integrated Pollution Control is an extension of this concept, and we welcome this Paper as a first step in the introduction of integration to UK pollution control.

It must be said that the true spirit of BPEO dictates an even broader approach. This is very much an 'Inspectorate' Consultation Paper, based on technological control of specified industrial processes. In the UK, pollution control powers are scattered throughout ministerial departments; there is no mechanism for developing the BPEO for important policy issues. What is the point in developing IPC for incineration plant if the effect is to push waste disposal to landfill? Who resolves the conflict between pesticide use and decreasing water quality? Where is there a mechanism to determine whether investment in energy conservation is a better environmental option than electricity generation, and how can policy be steered to the BPEO? How best can we meet our obligations to reduce the increasingly serious international and global pollution problems? Truly integrated pollution control will only become a reality when responsibility for policymaking is taken from the various Ministries, some of which stand accused of favouring the interests of the industries which they represent over the needs of the environment. What is needed is an agency with specific responsibilities for environmental protection which will ensure a co-ordinated and disinterested development of environmental policy in all sectors.

NSCA represents a broad cross section of pollution control practitioners, and copies of the Consultation Paper were circulated to members of NSCA Technical, and Parliamentary and Local Government Committees, and to NSCA Regional Divisions. A high degree of consensus was achieved in the responses, which are summarised below.

1. Responsibility for IPC

We note that the current proposals relate solely to processes regulated by HMIP. In the light of proposed air pollution control legislation, which extends the co-operation between HMIP and local authorities, consideration should be given to the development of integrated controls in tandem with local authorities. The Consultation Paper pays scant regard to the role of local authorities, which are accountable to the local community and, unlike HSE, have responsibilities which extend beyond the 'factory gate'.

It is unclear whether there will be a statutory requirement to consult other bodies and under what circumstances. As a minimum, the comments of the

District Council and Waste Disposal Authority should be sought on the terms of any proposed IPC consent in their area, and since consents are to be public documents, copies should be made available to local councils as a matter of course. Finally, as mooted in the DoE 1986 Consultation Paper "Air Pollution Control in Great Britain", duly authorised officers of the local council should have rights of entry for purposes concerning the enforcement of consent conditions.

There is considerable concern about the future for river water quality following the proposed privatisation of the water industry. The exact relationship between NRA and HMIP has yet to be clarified; NSCA believes that it should be included within HMIP, and fully resourced.

2. Criteria for Scheduling

It is clear that the initial proposals for scheduling the three classes of processes listed could be implemented in a relatively clear-cut fashion. It is disappointing, however, to note that there are no immediate plans to extend the IPC regime to other processes which are equally capable of creating environmental problems, albeit on a smaller scale. It would be wrong to assume that these processes are of little overall consequence. The objective of a single set of criteria governing discharges to all media would represent true integration in the spirit of BPEO; it should be more than just a "long term aim".

Further clarification is needed on the criteria to be used for scheduling. In particular, definitive guidance is needed on what constitutes "significant quantities" of Red List substances in discharges to water, and "large amounts" of special wastes.

In the case of water pollution where the control system is based on quality objectives, BATNEEC should be rigorously applied for all pollutants, not just those on the toxic Red List. In the air pollution sector BPM has proved to be fair in its application across industry; water discharges should similarly be controlled by the requirement to meet EQOs as a minimum, and to use BATNEEC in all cases. The Government now recognises the validity of the precautionary principle, and if they are serious about integration, this principle should apply across the board, otherwise EQOs can be abused as a "licence to pollute".

3. Implementation

A good case has been made for the residual duty incorporated within a consent model for implementation of the new IPC approach.

It appears that IPC is to be brought about by extension of the current legislation. Whilst the introduction of IPC should not be delayed, a commitment should be given to bring together the existing pollution control legislation into one comprehensive Act. The analogy lies with the separate Acts, such as the many Factories Acts, Mines and Quarries Acts, etc, which were unified into one piece of legislation as the Health and Safety at Work etc Act 1974. Health and safety legislation has evolved to a second, unified, level. It is now time for the pollution control legislation of all media, the proposed integrated pollution control policy, to develop in a similar manner.

4. Enforcement

Public confidence in the regulatory system will inevitably diminish unless sufficient qualified officers are appointed to police effectively any new legislation. It is becoming increasingly apparent that there are insufficient Inspectors to cope with existing legislation; any additional duties will throw an even greater burden on an already overstretched system. The three extra staff proposed and the current total complement of 202 would appear to be completely inadequate for the job in hand.

The introduction of charging for "authorisation, inspection and enforcement activities" is seen as a bad precedent, particularly when viewed in the context of the Government's desire to 'reduce the burden' on industry. The 'Polluter Pays Principle' should certainly apply to the costs of abatement technology, but not to the policing and enforcement of environmental policy. If a series of inspections were made to a particular plant, the industry concerned could plead that the costs involved were too great a burden to bear. Supplementary information contained in the Consultation Paper hints at a dangerously lax attitude, at least where small firms are concerned. The easiest way to lift the burden, and to reduce the bureaucratic demands on HMIP, would be to eliminate cost recovery charging.

SUMMARY OF RECOMMENDATIONS

1. When considering an IPC consent there should be a statutory obligation for HMIP to consult the local authority responsible for pollution control and waste disposal.
2. Duly authorised officers of the local council should have rights of entry for purposes concerning the enforcement of consent conditions.
3. The proposed National Rivers Authority should be placed under the control of HMIP, and fully resourced.
4. The objective of a single set of criteria governing discharges to all media should be given higher priority.

5. Definitive guidance is needed on what constitutes "significant quantities" of Red List substances in discharges to water, and "large amounts" of special wastes.
6. In the case of water pollution BATNEEC should be rigorously applied for all pollutants, not just those on the toxic Red List.
7. Whilst the introduction of IPC should not be delayed, a commitment should be given to bring together the existing pollution control legislation into one comprehensive Act.
8. The importance of the new Regulation should be reflected in an increase in resources and staff for HMIP, well in excess of that proposed.
9. Cost recovery charging is inappropriate for pollution control enforcement.
10. The long term potential for IPC can only be fully realised under the auspices of an agency with specific responsibilities for environmental protection.

**NATIONAL SOCIETY FOR CLEAN AIR
1989 WORKSHOP
OXFORD
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12 and 13 APRIL 1989**

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THE JOINT PROGRAMME FOR ACTION ON PESTICIDES

In February 1986 the House of Commons Agriculture Committee began an enquiry into the effects of pesticides on human health under the Chairmanship of Sir Richard Body MP. In May 1987, with the dissolution of Parliament and the General Election imminent, there was no time for the Committee to consider the Chairman's Draft Report. The Committee agreed to publication of the Draft Report, making it clear that no decisions had been taken on any of its recommendations, but stating "We believe that it is important that Parliament has, in its possession, the text which we would have wished to consider carefully".

The report was highly critical of many aspects of pesticide regulation and made 45 recommendations for change. Lack of proper enforcement of regulations, secrecy and inadequacy of monitoring were highlighted. The report received considerable media attention, but as it was not a consensus report Government departments did not feel bound to respond. To date, no official response has been forthcoming.

The report echoed the views of many voluntary organisations. At the time of its publication in July 1987 the Green Alliance was aware of unofficial support for Sir Richard Body's recommendations inside certain Government departments. The report thus presented an opportunity for voluntary groups to reinforce the sections of departmental opinion broadly in line with their views and secure significant changes in UK pesticide regulation.

The purpose of the Green Alliance Programme for Action on Pesticides is to assist environmental and other organisations to develop a lobbying agenda in order to sustain the momentum for change started by the Body Report. By mobilising support behind Sir Richard Body's recommendations the ultimate aims are to secure more effective regulation of new and existing pesticides including more efficient monitoring of effects on human health and the environment and improved training in handling of pesticides. Equally important are the aims of improved access to health and safety data and greater public awareness of pesticides issues. NSCA was involved in discussions about the Programme for Action, and in February 1988 the Technical Committee agreed to support the twelve recommendations contained in the 'Agenda for Action', which is given below.

Responsibility for co-ordination of the Programme for Action has now been assumed by the Pesticides Trust* which was set up earlier this year, and NSCA will be represented at future meetings of the Trust. Meanwhile concern is developing over the way in which pesticides will be treated in the

forthcoming COSHH (Control of Substances Hazardous to Health) regulations, and regulations made under the new FEPA (Food and Environmental Protection Act). COSHH regulations would provide better all round protection for users and the environment than FEPA regulations, which cover some of the same ground. However, it is rumoured that pesticides may be made exempt from the more stringent and more user-friendly COSHH regulations.

There are currently two Codes of Practice in draft, one under each set of regulations, and civil servants are now trying to reconcile them into one readable document. It will be necessary over the next few months to monitor the position to ensure that pesticides remain within the COSHH regulations. Clean Air will report on the progress of the joint Code.

* The Pesticides Trust, 20 Compton Terrace, London N1 2UN. Tel: 01-354 3860.

AGENDA FOR ACTION ON PESTICIDES

The following twelve recommendations outline the current priorities of over 30 voluntary bodies concerned with pesticide safety.

1. Transferral of responsibility for pesticide clearance from the Ministry of Agriculture, Fisheries and Food to the Health and Safety Executive. This recommendation supports the conclusion of Sir Richard Body's draft report from the Commons Select Committee on Agriculture investigation into the effects of pesticides on human health. The voluntary lobby sees an inherent conflict of responsibility in MAFF's dual role as sponsor and regulator of the agricultural industry — difficulties in balancing the different interests have been acknowledged by MAFF minister Baroness Trumpington (BBC Radio 4 "Face the Facts" 15.10.87). HSE already has responsibility for 10% of clearances, for enforcing the Control of Pesticides Regulations, and for some aspects of pesticides monitoring. It could also provide the statutory right of access to the clearance process demanded by many groups. Transferral to the HSE is thus seen as the best option for resolving this conflict under the present system. Nevertheless, this recommendation is made without prejudice to future developments which might include the establishment of an environmental protection agency, which remains for many the preferred option.

2. Implementation of undertakings made by Government to provide access to Evaluations (summary reports prepared for reviews and approvals of particular pesticides under the Control of Pesticides Regulations). These Evaluations should further be placed on the International Register of Potentially Toxic Chemicals maintained by the United Nations Environment Programme. The undertakings referred to above are very limited measures for provision of information, but even these have not been implemented. They apply only to new clearances and chemicals under review, not those already on the market. The Government has done little to fulfill the spirit of the second major aim of Part III of the Food and Environment Protection Act, 'to make information about pesticides available to the public'.

3. The establishment, at national, regional and district level, of public registers containing details of all enforcement notices served under the Health and Safety at Work Act, the Food and Environment Protection Act, the Fire Safety Act and the Places of Sport Act. This is the aim of Chris Smith's Environment & Safety Information Private Member's Bill which has now become law. Voluntary groups support this measure to allow access to notices affecting public health and safety and the environment, particularly as it applies to safe use of pesticides.

4. Clarification that there will be access to evaluations and study reports of genetically engineered pesticides under the provisions of the Food and Environment Protection Act. Further, applications for approvals of genetically engineered products to the Advisory Committee on Genetic Manipulation should be published in the London and Edinburgh Gazettes. There is great concern amongst voluntary groups about the implications of genetically engineered organisms, and reassurance is needed that they will be covered by the statutory right of access to information provided by FEPA.

5. The instigation of a systematic programme for review of pesticides approved under conditions less stringent than the present. There is widespread concern that the present review procedure does not constitute a coherent programme, and may allow chemicals whose safety is doubtful to remain on the market. A MAFF official said in evidence to the Agriculture Committee that for older chemicals "there may well be considerable (data) deficiencies in terms of today's standards" and companies would have to produce additional data "to justify continued sales". Increased resources are needed to conduct a proper programme for the 150 active ingredients requiring re-registration. We suggest that a timescale of five years would be acceptable, as opposed to the twenty years estimated on the basis of present resources which can deal with only eight re-registrations a year. This would

require increasing relevant staff from four to at least sixteen, and a corresponding increase in capital and current expenditure.

6. The provision of increased resources to the Health and Safety Executive to ensure proper enforcement of the Control of Pesticides Regulations. The present level of resourcing is inadequate to meet the extra duties placed on the Health and Safety Executive by the Food and Environment Protection Act. The Government has effectively legislated for a set of regulations it has no reasonable prospect of enforcing. The proposed ten new agricultural inspectors will not remedy this situation. The Institution of Professional Civil Servants estimates that more than 100 additional inspectors would be needed to properly enforce the regulations. Problems with enforcement are likely to be exacerbated by the fact that an estimated 20% of the present 150 agricultural inspectors are due to retire in the next five years, and the fact that not all of the provisions of the Food and Environment Protection Act have yet come into force.

7. Pesticides Regulations should be made under the Health and Safety at Work Act 1974. Such regulations would provide legally enforceable measures on pesticides equivalent to measures provided for other substances under the Control of Substances Hazardous to Health Regulations. COSHH regulations provide better worker health and safety because they introduce new conditions such as risk assessment, operational control, health surveillance and record keeping. Pesticides may have a Code of Practice under COSHH, but this will not have the full force of law.

8. The provision of a comprehensive, free and independent advice service to farmers and other pesticides users. It is clear that a more effective advice service is needed to ensure safe use of pesticides. Documents such as the Friends of the Earth Incidents Reports are catalogues of misuse, and a recent Agricultural Training Board report indicated that over 50% of farmers do not think the regulations apply to them, and a further 25% do not understand them. A good advice service could significantly decrease the need for enforcement effort.

9. The extension of mandatory training schemes to cover all pesticide operators. There is increasing concern that pesticide users on farms are not adequately trained. The Agricultural Training Board Report referred to above showed that only a third of those people handling pesticides and thus required by the regulations to receive a certain level of instruction had plans to be trained. Only two-thirds of those required to be certificated by January 1989 were likely to be trained in time. The increasing amount of untrained casual labour employed on farms gives rise to further concern.

10. The introduction of Maximum Residue Limits should be accompanied by the provision of increased resources for proper monitoring of residues. This includes resources to environmental health officers, public analysts and port health officers monitoring residues in imported food. There should also be an increase in the scope of monitoring to test more samples from a broader range of foodstuffs, and an increase in the number of total diet studies.

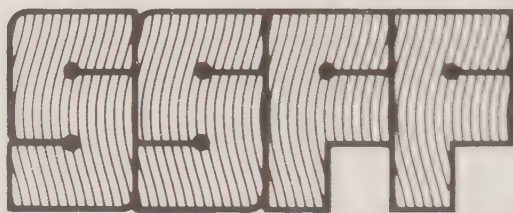
11. The establishment of a National Pesticides Incidents Monitoring Scheme by the Health and Safety Executive. The present four systems for reporting pesticides incidents give very different results and there is a clear need for a co-ordinated system. This need is reinforced by the HSE's own estimate that 90% of accidents in agriculture are unreported. The HSE should further investigate the possibility of establishing a National Pesticides Database on Pesticide Poisoning which could provide information and advice for pesticides users, enforcement officers and GPs.

12. The development of a government co-ordinated and funded programme for research into the long-term effects of pesticides on human health, including research on the refinement of techniques for detecting chronic effects. There is concern amongst voluntary groups that the need for monitoring of chronic effects is not being taken seriously, and that there is little co-ordination of information in this respect with other countries.

We additionally recommend that the option of organic farming should be firmly established by Government. A useful first step would be to introduce organic standards based on the British Organic Standards Committee (which set the Soil Association Standards) which would be the most suitable in the UK at the moment.

The Agenda for Action on Pesticides has been drawn up in consultation with over 30 groups including: Bakers, Food and Allied Trade Union, Campaign for Freedom of Information, Consumers in the European Community Group, Council for Environmental Conservation, Earth Resources Research, Edmonton Association of Community Groups, Farm & Food Society, Friends of the Earth, Henry Doubleday Research Association, Institution of Environmental Health Officers, Institution of Professional Civil Servants, London Food Commission, London Hazards Centre, National Society for Clean Air, National Federation of Womens' Institutes, National Union of Public Employees, National Union of Townswomens' Guilds, Organic Growers Association, Pesticides Trust, Royal Society for Nature Conservation, Small Farmers Association, Soil Association, Transport and General Workers Union, Youth Hostel Association, Worldwide Fund for Nature.

SOLID SMOKELESS

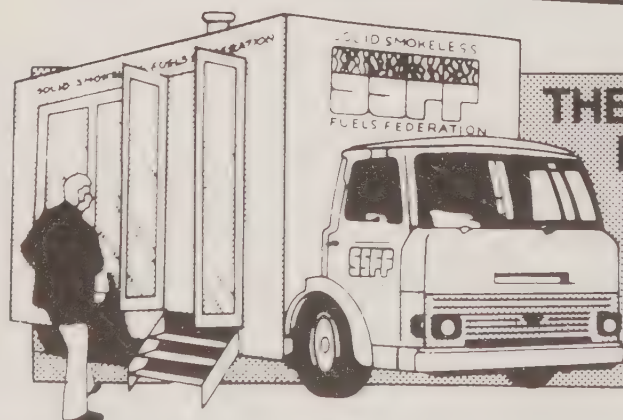
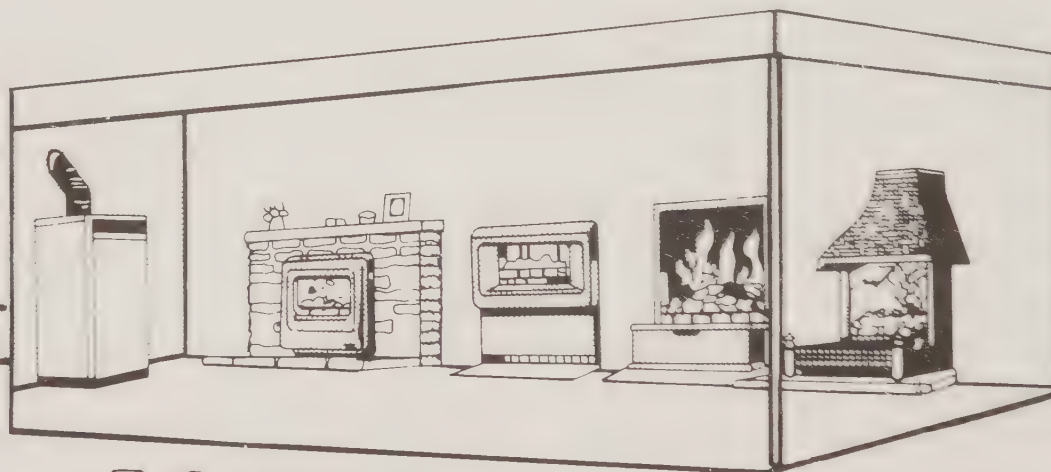


FUELS FEDERATION

The Solid Smokeless Fuels Federation is an independent advisory organisation promoting the interests of the Producers and Distributors of domestic Solid Smokeless Fuels.

The Federation's primary aim is to encourage and develop the use of Solid Smokeless Fuels for domestic heating.

Since the introduction of the 1956 Clean Air Act the Federation's work has been closely linked with Local Authorities encouraging the use of Authorised Solid Smokeless Fuels on approved appliances.



**THE FEDERATIONS STAFF AND
EXHIBITION EQUIPMENT
ARE AVAILABLE TO
LOCAL AUTHORITIES
INTRODUCING SMOKE
CONTROL AREAS**

SOLID SMOKELESS



FUELS FEDERATION

**DEVONSHIRE HOUSE · CHURCH STREET
SUTTON-IN-ASHFIELD
NOTTINGHAM NG17 1AE
TEL: MANSFIELD (0623) 550411**

UPDATE

GOVERNMENT ACTS ON CFCs

The Government has supported the report of the Stratospheric Ozone Review Group which says that a cutback of at least 85% in CFCs is needed simply to stabilise the damage being done to the ozone layer. Lord Caithness, Environment Minister, called for further urgent reductions in CFCs worldwide and for the international community to bring forward the timing of the cuts already provided for in the Montreal Protocol, and indeed for review of the Protocol to be completed in 1989 instead of 1990.

A report from the US Environmental Protection Agency has said that only a complete phasing out of CFCs and halons can stabilise future ozone levels.

GEOHERMAL HEATING

Brine lying more than a mile below the city of Southampton, is being pumped to the surface to provide heat to the Civic Centre and the Institute of Higher Education in the UK's first geothermal heating scheme; other commercial and industrial buildings in the city centre are also to receive the hot water for heating, which is suitable for houses as well.

The £3.8 million pioneering scheme results from a partnership between the public and private sectors. The project was begun by the City Council in conjunction with the Department of Energy after a research borehole found water at a temperature of 76°C at a depth of 5,500 feet in 1981, and continued with

private sector help following the withdrawal of the Department of Energy.

As well as using geothermal heat, the scheme also makes use of combined heat and power. A diesel generator provides power for the pumps and plant, and the heat from that process contributes to the scheme's heat supply. The scheme is designed to be flexible and can easily be adapted to provide other forms of energy, including alternative energies.

The geothermal project, which is EEC grant-aided, will also provide the first opportunity in the UK to monitor the performance of an aquifer over a long period.

ADC TURNS GREEN

A working party on environmental issues set up by the Association of District Councils has issued its first report*, with a wide range of recommendations for action by local and national government. "Everyone is green these days", announced ADC's Environmental Health Chairman Lady Anson at the launch of the report, which specifically endorses NSCA policy on Crown Immunity, motorcycle noise and stubble burning. Other policy areas covered include ozone, lead in petrol, water pollution, waste disposal and recycling. Ever keen to hasten the demise of County Councils, ADC considers that English Districts should take over responsibility for waste disposal, as already happens in Wales. Under-secretary Michael Ashley suggested that smaller districts should combine to share disposal facilities.

* *Pollution: Controlling the Problems; Association of District Councils, 9 Buckingham Gate, London SW1. Price £2.50.*

LEAD-FREE TIMETABLE

Regulations laid before Parliament will require all new type models of cars to be capable of running on lead-free petrol from 1 October next year; for new registrations of existing model types the date is 1 October 1990. The regulations will apply irrespective of engine size. However, the car industry will still be able to delay the inevitable as there are "special arrangements for the small number of models that would need major engineering changes to comply", something which most manufacturers are already having to do in order to comply with US and Japanese standards.

LANDFILL SURVEY

Waste Disposal Authorities in England and Wales have been asked to complete detailed surveys of landfill sites in their areas as soon as possible. The survey will establish which sites may generate quantities of methane gas and the likely risk of gas migration which might be a risk to nearby properties, as well as ensuring that all potentially risky sites have been identified. HMIP is currently preparing new advice to strengthen and extend the current arrangements on the control of landfill gas at both active and closed sites.

RADON HOTSPOTS

The Institution of Environmental Health Officers has warned that between 50,000 and 90,000 homes in Britain may have radon concentrations that exceed government "action levels" of 400 becquerels per cubic metre of air. Radon, a natural product of the radioactive decay of uranium is acknowledged in several countries as the second most important cause of lung cancer, after smoking. The warning follows a national survey in 121

local authorities in England and Wales which revealed previously unknown radon hotspots. While it has been known for some time that homes in some parts of the UK, notably Devon and Cornwall, were at risk from radon-seepage, the IEHO survey has recorded concentrations well in excess of the government limit in Cumbria, Staffordshire, the West Midlands and mid-Glamorgan.

'RED LIST' PUBLISHED

The Government has published a consultation paper setting out its detailed proposals for tightening controls over the input of the most dangerous substances to water — the so called 'Red List', which identifies those substances which are thought to pose the greatest threat to our water environment and the system of controls through which it is proposed to minimise the amounts of these substances reaching our inland and coastal waters.

The initial 'Red List' contains 26 substances selected on the basis of their toxicity, persistence and capacity for bioaccumulation. Industrial processes discharging significant amounts of 'Red List' substances will be prescribed for control by HMIP and will have to satisfy the Inspectorate that the process will be operated using best available technology not entailing excessive cost in order to minimise the amounts of these substances discharged.

Discharges will continue to have to satisfy environmental quality objectives which water authorities set for the receiving waters.

The Government hopes to start implementing the proposals on an interim basis during the second half of 1989.

ACCESS TO INFORMATION

The Environment and Safety Information Act 1988, which is scheduled to come into force on 1 April 1989, will require the establishment of a public register of enforcement notices served under the Health and Safety at Work Act 1974 (thus covering industrial air pollution as well as safety). Entries on the register will cover all notices except "those which impose requirements or prohibitions solely for the protection of persons at work". The Act also applies to notices served under among others, the pesticides provisions of the Food and Environment Protection Act 1985.

ENVIRONMENT-FRIENDLY GOODS

Consumer demand for information on how individuals can help protect the environment has led the Canadian Government to draw up plans for a vetting and labelling system for "environmentally-friendly" products and processes. The scheme to come into effect in January includes government, trade unions, the private sector as well as representatives of environment and consumer organisations. The panel is to be established under Canada's Environment Protection Act which comes into force soon.

DoE RESEARCH GRANTS

The DoE is inviting research proposals for consideration under its recently launched Environmental Protection Technology Scheme. Priority areas for initial grant-aid have been identified as thermal treatment of municipal waste and odour control; further priority areas will be announced shortly. Grants will be given towards the cost of taking innovative ideas in pollution abatement technology to "proof of concept".

PETROLEUM COKE DANGERS

The campaign against the use of Petroleum Coke in the domestic market at last seems to be making an impact. Recently the Solid Smokeless Fuels Federation, Domestic Coal Consumers Council, Solid Fuel Advisory Service and British Coal have been publicising the possible dangerous consequences of burning Petroleum Coke in domestic appliances. Its extremely high heat content which combined with low ash and high sulphur properties can cause excessive damage to appliances. Following representations from British Coal, the DoE has removed two blends — Calco Superheat and Calco Cosycoke — from the list of authorised fuels for use in Smoke Control Areas. Efforts continue for a ban to be imposed on imports of Petroleum Coke for domestic use.

ENERGY SAVING

A study carried out by the Building Research Energy Conservation Support Unit has concluded that domestic gas-fired condensing boilers are more efficient than standard boilers, saving energy and reducing fuel bills. The study, on behalf of the Energy Efficiency Office, looked at 30 identical homes in Manchester; the energy saving in a four bedrooomed, seven person occupied house was about 21% when compared to standard boiler installations representing a saving of £77 per year, with a payback of just over three years for the cost of a boiler.

BRE Information Paper 10/88 The Performance of gas fired condensing boilers in family housing. Price £1 (min. order £3) from Publication Sales, BRE, Garston, Watford WD2 7JR.

INDUSTRIAL NEWS

WIND POWER

The CEEB is to build wind farms at Langdon Common (County Durham), Capel Cynon (West Wales) and near Launceston (North Cornwall). Each site will have 25 wind turbines with a electrical output of 300 – 500 kW, and an operating life of 25 years. At a peak operating capacity of 8 MW, each park will be able to supply around 5,000 people. It is hoped that the wind parks will be producing electricity by 1990. The CEEB is also to construct an off-shore turbine on the North Norfolk coast with a peak output of 750 kW, which should be in operation in the early 1990s.

WORLD'S LARGEST SULPHUR REMOVAL PLANT

The Secretary of State for Energy has given the CEEB the go-ahead to build the world's largest power station sulphur removal plant. The £400 million plant, the first of its kind in the United Kingdom, will be built at Drax power station in Yorkshire, and is expected to begin operating in 1993, with completion of the final phase in 1995. Once completed emissions of sulphur dioxide from the station are expected to be reduced by about 90%, some 240,000 tonnes a year. The FGD process selected for Drax uses limestone to remove the sulphur dioxide from the flue gases and then converts the residue into gypsum which is used by the building industry, for example to make plaster board.

CFC RECOVERY PLANT

The UK's first Chlorofluorocarbon recovery plant was opened in September. Developed by Hyman plc, the plant at Glossop in Derbyshire deals with all the emissions from the foam plant, including Toluene diisocyanate as well as CFCs which contribute to the depletion of the ozone layer.

The new carbon adsorption plant at Glossop not only reduces the escape of CFCs into the atmosphere, but also allows the chemicals to be efficiently recycled. It operates by passing polluted air extracted during the production process through an adsorption bed packed with activated carbon. The carbon acts as a molecular sponge and practically pure air flows out of the other end of the unit. To recover the chemicals, the process is simply reversed. Steam is passed through the carbon bed, and the resulting vapour, a mixture of water and CFC is separated and condensed.

ODOUR CONTROL FILTER

A new biological method of controlling odorous emissions claimed to be almost 100% efficient, which has been developed by Clairtech in the Netherlands is attracting interest in the UK. The Bioton filter has a series of modular sections containing compost, which acts as a carrier material and nutrient source for micro-organisms which are selected for their ability to break down the odorous components in particular waste streams. Contaminants in the gas stream are dissolved in a water film on the surface of the compost, making them accessible to the microbes. Other filter components include polystyrene granules which act as a bulking agent to minimise pressure drop

across the system. The filter has low energy and maintenance costs and Clairtech is planning to expand its capacity to deal with complex aromatic compounds such as Benzene. They have already developed a trickling bed filter to deal with gas streams containing chlorinated hydrocarbons and ammonia.

FGD & PROCESS SCRUBBING EXPERTISE

A new company specialising in process scrubbing, with expertise in flue gas desulphurisation has been established by air pollution control engineers Nairb Air

Ltd of Leicester and Environmental Process Design Consultants of Penarth, South Glamorgan. Based on the Impinjet wet scrubbing systems for removal of fume, dust or odour from process air, Nairb Air's new Environmental Process Design division offers advisory services in design, installation and operation of flue gas desulphurisation processes. The new division will widen applications for the Impinjet design which provides a low cost method for most process scrubbing techniques including dust collection, gas absorption, stripping of gases, gas cooling and vapour condensation in air flows from 1,700 to 125,000 cfm.

NSCA NEWS

CROWN IMMUNITY

The results of the NSCA survey of air pollution from Crown Properties* were published in September, giving a considerable boost to our campaign for the removal of Crown Immunity. The survey revealed that the problem of air pollution from Crown property is widespread, that the main offenders are hospital incinerators and boiler plant, and that environmental health officers see Crown Immunity as the main obstacle in the effective enforcement of pollution control in this area.

We have continued to press both the DoE and DHSS on the subject. As a result, the DHSS has told NSCA that a £50m programme of upgrading incinerator plant is

now planned, that a new BPM standard for hospital incinerators is under discussion, and that new air pollution control legislation will effectively remove Crown Immunity from NHS properties. Interestingly, the DHSS appears to confirm that air pollution *legislation* is expected next year.

This does look like a major victory for the NSCA campaign. However the new proposals are only likely to apply to NHS property; other Crown Properties may still escape control. We have sought clarification from the DoE on this, but no official information is yet available.

* *Air Pollution from Crown Properties; available from NSCA. Price: £3 inc. p+p.*

ANNUAL REPORT

The 1987/88 Annual Report and Review has now been sent to all NSCA members. If any readers of Clean Air would like a copy, please contact the NSCA office in Brighton.

MUNICIPAL WASTE INCINERATION

The NSCA recently gave evidence on the proposed EC Directive to the House of Lords Select Committee on the European Communities, Sub-Committee F. A copy of the evidence, to which Byrom Lees refers in his article on the Directive which appears in this issue of Clean Air, is available from the NSCA office in Brighton.

CLEAN AIR CONFERENCE

More than 300 people attended the NSCA's annual Conference held in Llandudno from 24 – 27 October. Lord Ezra's keynote speech set the tone for the conference in suggesting the need for a coordinated national energy policy to be developed – a theme taken up by many other speakers during the conference. A report of the conference will be included in the next issue of Clean Air.

NSCA STAFF CHANGES

Loveday Murley joined the NSCA staff in September as Editor of Clean Air and of the NSCA's other publications. Loveday joins the NSCA having spent three years as Head of Liaison for the International Organisation of Consumers Unions in The Hague.

NSCA also welcomes Mary Stevens as Assistant Information Officer and Wendy Messer who both joined the staff in August. Wendy takes over as secretary to the Secretary General and the Administration Manager while Vanessa Draper is on maternity leave.

MANCHESTER AREA COUNCIL

At their recent AGM, members of the Manchester Area Council for Clean Air and Noise Control voted to expand their functions to embrace all aspects of environmental control, thus reflecting the integrated approach to pollution control now advocated by the UK Government. To reflect its wider interests, the Council agreed to a new name: The Manchester Area Pollution Advisory Council (MAPAC).

EAST MIDLANDS DIVISION

Fifty-seven people attended the AGM of the East Midlands Division held at Sutton-in-Ashfield in June. The Hon. Secretary, Mr. E.F. Raven reported a busy year which had included carrying out the survey for the NSCA on exhaust noise from motor cycles. Following the AGM, at which Dr. D. Davies was elected Chairman for the following year, guest speakers from Mardon Illingworth Limited described problems experienced in tracing the source of water pollution at the works, as well as the company's products, and a speaker from Pretty Polly Limited described his company's products. Members then had the opportunity to visit one or other firm to see the various manufacturing processes.

WOMEN'S SOLID FUEL COUNCIL

In her preface to the 1987/88 Annual Report of the WSFC, national chairman Mrs. E. Warnock, drew attention to the success of their promotions for solid fuel which had been attended by over 2,000 women from both women's organisations and local authorities. It was also gratifying to note, she said, increasing interest in the WSFC's activities from a younger age group.

FUTURE EVENTS

22–24 NOVEMBER — Workshop: EEC Air Quality Directives & the Harmonisation of their Implementation in the Member States

Organisers: EC Commission

Venue: Lyon, France

Details: M. Bonhoure, IIGGE, BP 128, 73101 Aix-les-Bains Cedex France

22–25 NOVEMBER — International exhibition and conference: POLLUTEC 1988

Organisers: POLLUTEC

Venue: Lyon — Eurexpo

Details: Pollutec, Tel: Paris 47429256

25–27 NOVEMBER — Conference: Noise In & Around Buildings

Organisers: Institute of Acoustics

Venue: Windermere Hydro

Details: IoA, 25 Chambers St, Edinburgh EH1 1HU

28–29 NOVEMBER — International Conference: Ozone Depletion

Organisers: Consumers' Association, Friends of the Earth, European Campaign against Cancer

Venue: RIBA, Portland Place, London W1

Details: CA, 2 Marylebone Road, London NW1

5–6 DECEMBER — 3rd International Energy Conference

Organisers: Royal Institute of International Affairs, The British Institute of Energy Economics, The International Association of Energy Economists

Venue: RIIA, London

Details: RIIA, Chatham House, 10 St. James's Square, London SW1Y 4LE

6 DECEMBER — Seminar Fossil Fired Fuel Emissions

Organisers: Institute of Mechanical Engineers

Venue: IMechE HQ, London

Details: IMechE, 1 Birdcage Walk, London SW1H 9JJ

12–13 DECEMBER — Conference — Fluidised combustion in practice

Organisers: The Institute of Energy

Venue: Scientific Societies Lecture Theatre, London

Details: Institute of Energy, Tel: 01-580 0008

BOOK REVIEWS

ENCYCLOPEDIA OF ENVIRONMENTAL HEALTH LAW AND PRACTICE

Ed. Charles Cross; Publishers: Sweet & Maxwell. Price: £165.

It may be expensive, but 'Environmental Health Law' does cover all the legislation relating to pollution control, sanitation, nuisance, noise abatement — including relevant statutes, regulations, judicial decisions and circulars. The Encyclopedia is updated three times every year and is well indexed and annotated; an invaluable addition to any pollution control library.

CAREERS IN CONSERVATION

John McCormick. Publishers: Kogan Page, 1988. Price: £3.95. ISBN 1-85091-607-1

Third edition of useful guide for anyone interested in a career in environmental issues. As well as describing the various openings in the voluntary, professional and governmental sectors, relevant qualifications and experience, the guide explains the different specialisations of all the organisations.

ENERGY AND ENVIRONMENTAL TERMS: A GLOSSARY

Peter Brackley. Publishers: Gower, 1988. Price: £18.95. ISBN 0-566-05759-X

Hundreds of words, acronyms, agreements and conventions, organisations, chemical terms explained concisely and in Plain English. Particularly valuable for those with only a limited knowledge of scientific, and indeed environmental language.

ENVIRONMENTAL DIRECTORY

*Edited by Saskia Hallam. Publishers: Civic Trust, 1988. Price: £4.00.
ISBN 1-870257-057*

Details of more than 300 UK organisations including government bodies, voluntary, professional and trade associations concerned with conservation and environmental issues.

OUR COMMON FUTURE A Perspective by the United Kingdom on the Report of the World Commission on Environment and Development

Publishers: Department of The Environment, 1988. Free.

UK Government Response examines in detail the Report's recommendations from a UK perspective, with a foreword from the Prime Minister, Mrs Margaret Thatcher, welcoming the Brundtland Report and endorsing the concept of sustainable development.

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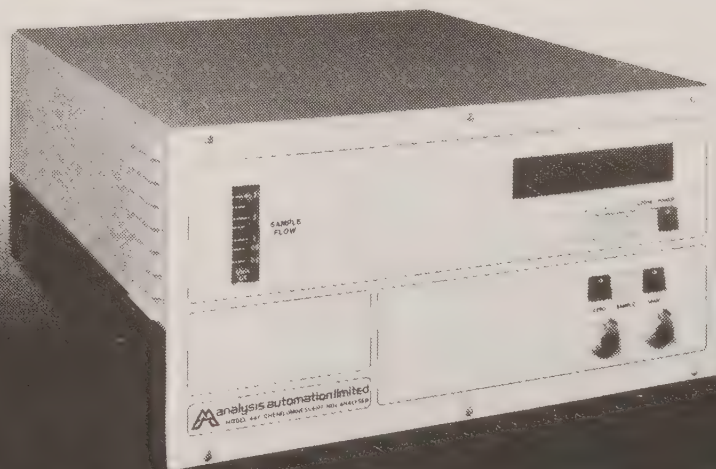
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EDITORIAL

A CHANGE IN THE AIR?

In our last issue we remarked on the apparent greening of the Government and pondered whether their welcome statements of intention were likely to be translated into firm and effective action across the whole field of pollution control and abatement. This came under close scrutiny at the December meeting of the Society's National Council. The thoughtful comments of the Prime Minister on acid rain, stratospheric ozone depletion and climate change were contrasted with the surprisingly uninformed views of her Secretary of State for the Environment on the possible role of nuclear power in substituting for fossil fuels. Accepting that he could not have been briefed on the subject what faith could be placed in his equally confident assertion that the privatisation of the water industry would be in the best interests of environmental protection?

The publication in December of the consultation paper on air pollution control was seen as a further sign of the Government's increased concern for the environment, and that the long overdue review of clean air laws is moving towards the top of the political agenda. Let us hope that once again an overcrowded parliamentary timetable does not delay the introduction of primary legislation. Although the regulatory process under Section 5 of the Health and Safety at Work Etc Act may make us respectable in the eyes of our Community partners, it would be a less than satisfactory substitute for a comprehensive bill embracing all the various aspects of pollution control — currently scattered throughout a number of different Acts and Regulations — thus adopting an integrated approach to pollution control. Comments on this latest consultation paper are requested by mid March and the Society's response will be included in the next issue of Clean Air.

Inevitably, the Council discussed the resignation of HM Chief Inspector of Air, Water and Waste in the light of his detailed statement setting out his concerns over the resourcing and proposed reorganisation of HMIP — concerns which came as no surprise to us. The NSCA has consistently argued that the Inspectorate should be professionally led and properly

resourced. It is now clear that this Inspectorate, only set up in 1987, is being structured to meet a budget, rather than the actual requirements for pollution control. Without exception, all the industrial members of Council who, having worked with the inspectors over the years, and being fully aware of their strengths and weaknesses, were gloomy about the future in the absence of any change in political direction. The view was expressed that there was a danger of seeing a total breakdown of the "best practicable means" approach to air pollution control, and that the achievement of sound environmental quality objectives was at risk. It was agreed that the Society's concerns should be brought to the attention of Ministers at the earliest possible opportunity.

The NSCA's annual conference held in October was, as usual extremely well attended. The keynote speech was given by former NSCA President Lord Ezra who looked at the way in which a coordinated energy policy could contribute both to energy efficiency and to controlling air pollution. His speech, together with a report of the conference are included in this issue of Clean Air.

Finally, the staff at the Headquarters in Brighton wish all Clean Air readers a happy and successful 1989.

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CONFERENCE REPORT

Over 300 people attended the 55th Annual Conference of the National Society for Clean Air, held at the Canolfan Aberconwy, Llandudno, from 24 – 27 October. Many of the speakers took up Lord Ezra's call for a coordinated energy policy. The final version of the papers presented will be available shortly from our office in Brighton.

ENERGY POLICY AND THE ENVIRONMENT

Keynote address given by

the Rt. Hon. Lord Ezra, Kt, MBE

at the 55th Annual Clean Air Conference, on 24 October 1988

Mr. Chairman, Lord President, Ladies and Gentlemen: this is a nostalgic occasion for my wife and myself in two ways. First because I am glad to say it is not our first visit to Llandudno. We came here on two or three occasions during my period in the coal industry and were always extremely well received, as we have been on this occasion. Secondly, as your Chairman in his very kind remarks mentioned, I was of course President of this Society during the period from 1979 to 1981. So, I am delighted to have been invited.

What I would like to do is to take a broad view of the environmental scene in Britain today with special reference to clean air — I think we have come to an historic moment in the protection of the environment and we should ponder over that and then consider what the Society can do to advance the cause which is supported now by more and more people.

The coal industry and clean air

However, before I do that I would like to refer to my old industry — the coal industry — which is frequently associated with atmospheric pollution. In point of fact it was among the first to welcome the concept of clean air. When the legislation which Sir Gerald Nabarro presented to Parliament in 1955-6 was proposed the coal industry fully supported it.

The Clean Air Act of 1956 probably had a more drastic affect on the nature and appearance of this country than any other legislation in living memory because it cleaned up the cities and it removed the smog — it was a historic landmark in our march towards clean air. It cleaned the visible pollutants out of the atmosphere. Since then time has marched on again and there has been a battle against the invisible pollutants. And here again I

must say that the coal industry both in my time and I am sure since I left, has tried to battle against that too; the fluidised bed combustion system was devised specifically to retain the sulphur element in solid fuel in the ash so that it didn't get into the atmosphere. So nobody can say that the coal industry was in any way backward in trying to make sure that its products created the minimum environmental pollution.

Global issues

Recently, the public in this country and in all other countries in the world have become more and more conscious of the environment and rightly so; the fact is that whereas in the 1950s environmental problems were regarded as a purely localised problem, a national problem, now of course they have become globalised. To take an example, it had always been assumed that the high stacks of power stations would ensure that the sulphur emissions which occurred would not in any way pollute this country. That was true; however unfortunately part of the pollution emitted from our high stacks made landfall in Scandinavia and in other parts of Europe as what is now known as "acid rain".

So this was the first evidence of the globalisation of the problem of atmospheric pollution, but globalised in a European sense. Now there is globalisation in a world sense with the problem of the ozone layer and the problem of the greenhouse effect, the greenhouse gases. Both these are subject to a great deal of scientific enquiry but I think it is a considerable testimony to the age in which we live that there is already widespread recognition that this is potentially a very serious danger, perhaps not so much for ourselves but more especially for future generations — there is talk of both these problems and particularly the greenhouse effect, having some consequence for the world in the early part of the next century. Pollution has ceased to be purely a national problem, it has become a global problem.

Britain's role

The next thing I want to say is that, if that is so, we have got to consider what role Britain is going to play; hitherto, I am sorry to say that I have thought that this country in recent years has been dragging its feet on environmental matters. We were continually hearing in the House of Lords debates on the subject that, "well, there may or not be a problem, that we need more scientific evidence"; well you can go on for ever asking for more scientific evidence; if you want 100% evidence you probably would never get it and that seemed to many of us to be an excuse for inaction.

However, the Prime Minister made a speech to the Royal Society on 27 September which suggested that she is now convinced that environmental issues are of importance. I asked a question in the House of Lords as to whether this meant that the government now in fact attached more importance to this than previously. This was rigorously denied. We have always attached importance to environmental issues, I was told. So it seems that Britain is now going to start leading where it has appeared in certain respects to lag: leading not only in the acid rain problem, but also on the ozone problem and on the greenhouse problem.

As far as the acid rain problem is concerned my feeling is that the solutions to it are very clear: desulphurisation equipment must be put into existing power stations; this has started to happen, but on nothing like the scale in, for example, Germany where they are spending three or four times the amount we are on desulphurisation equipment.

Fuel efficiency

On the greenhouse problem, the real issue here to my mind is not that we can give up using fossil fuels — that's impossible for a long time ahead — the real issue is to use all forms of energy more efficiently, and it concerns me that not enough is being done to encourage fuel efficiency. The trouble about fuel efficiency is that people think about it more only in time of crisis. When there was an oil crisis in 1974 and again in 1975 everyone was talking about fuel efficiency, but when the price of oil collapsed, interest in fuel efficiency diminished; this is shortsighted because sooner or later the price of oil is going to increase, and in any event from the point of view of the greenhouse effect fuel efficiency is of great importance.

In my opinion fuel efficiency is a key area in energy policy and in environmental problems. There are forms of energy of course which are relatively benign; however, I believe that fossil fuels will continue to contribute in large measure to the energy requirements of this country and we need to use them more efficiently than before. There are also energy sources which do not create the same kind of pollution problem — for instance, nuclear power. This, however, has its own environmental problems: it may not contribute to the greenhouse effect but there is the huge problem of radiation to which we need to address ourselves — both the risk of radiation emissions from the nuclear process itself and the problems of disposing of nuclear waste. And then there are other forms of energy; for example, in the House of Lords recently we completed a report of the so called "benign" forms of energy and we decided that one of the biggest prospects lay in windpower, which is now being looked at by the CEGB. I think we ought to be devoting more resources to those energy sources which do not add to the greenhouse effect and which could increase our diversification.

Ozone layer

Turning to depletion of the ozone layer, I am pleased that this country is now beginning to take a lead and that we have recognised that we must move a good deal faster than was suggested in the Montreal Protocol and eliminate the emission into the atmosphere of CFCs to diminish the weakening of the ozone layer.

Coordinated approach

What I believe has to be done is to look at environmental problems as a whole, particularly insofar as they affect the atmosphere. This must be done on a concerted basis and not as hitherto dealing with problems as they arise. The acid rain problem has arisen, we have argued about it, are finally convinced and now we have done something about it. The greenhouse effect has arisen, we have looked at it and we have decided that we might do something about it and so on. I think we have got to start looking at these things as a whole, we can't just go on being *ad hoc* about this situation; and so this is my main proposal: there is ground now for a coordinated approach to the atmospheric environment and that this is now urgently required.

However, once you say that then you raise the whole question of an energy policy because you can hardly have a coordinated approach to atmospheric pollution unless you link it to a coordinated energy policy. This is a very important issue because the present government's policy is, in matters of energy as in other matters of economic activity, that

the whole operation should be market related. I don't object to market relations, I'm all in favour of competition and free trade and the consumer benefitting and the producer benefitting, and getting more efficient. But there are certain areas which require a different treatment and, so far as the environment and the atmospheric environment in particular are concerned, I believe that market forces are not the solution. There is the possibility that the market forces of today might lead us to a solution which would be very harmful for future generations. So if it is agreed that these are issues which go beyond the straightforward operation of the marketplace, then you are led on to consider whether there shouldn't be a coordinated policy in regard to energy, which after all is one of the main factors affecting the atmosphere; I think, therefore, that we need to rethink our approach to energy and the environment.

NSCA role

I would like to suggest that the Society takes the opportunity of looking at this historic phase in our approach to atmospheric pollution; the phase is that we are moving from the national to the global and that in taking up a global position on the problems of atmospheric pollution, inevitably we must start looking at a coordinated energy policy which will link in with, on the one hand the minimisation of atmospheric pollution and, on the other, providing people with the energy resources which they need.

CONFERENCE ROUND UP

Welsh welcome

Having warmly welcomed the Society — in Welsh and in English — back to Llandudno for its 55th Annual Conference, Cllr. R. Ivor Thomas, Mayor of Aberconwy, told delegates that the fight for the environment was crucial — the consequences of our actions both as individuals and collectively were becoming all too apparent; it was important to increase public awareness of pollution issues if we were to safeguard the environment for future generations.

A coordinated energy policy

"A new historic phase in the whole approach to the environment" was how Lord Ezra, keynote speaker at this year's conference, summed up his call for the

UK to develop a coordinated energy policy; such a policy was a vital element if Britain was not to continue to be seen by her European neighbours as dragging our feet in the quest to halt destruction of the environment both at home and abroad.

It was important that such a strategy should look at future energy needs, all the various possibilities for meeting these needs — be it by nuclear or other "benign" sources, such as windpower — and to look at their effects on the environment. A coordinated energy policy should take account, on the one hand, of the need to minimise atmospheric pollution — both globally and nationally — and on the other, to provide the energy resources people need.

Windpower — the Energy of the future?

Clean, available and rapidly becoming economically viable, windpower could be providing 1000 MW of electricity — enough for half a million people — by 2005; this said, Dr. Philip Surman (CEGB) would save the combustion of a million tonnes of coal a year. However, he stressed that all systems of electricity generation have advantages and disadvantages, and that coal and nuclear energy are likely to remain the backbone of electricity generation.

Conservation v. generation

These two issues were complementary said Jim Skea of the University of Sussex Science Policy Research Unit; he pointed to the part that greater awareness of energy efficiency could play in cutting down on air pollution, and on conservation; thus he questioned the CEGB's forecasts that an additional 12 MW of generating capacity will be needed by the end of the century; he pointed out that the CEGB's present programme will bring capacity up to 64 MW as against maximum demand of 47 MW. The effects of privatisation, and the "greening" of the government were seen as major factors in the effectiveness of energy conservation and generation.

Energy policy

Dr. John Chesshire also of the University of Sussex Science Policy Research Unit (SPRU) reviewed the way in which decisions on energy issues had been influenced by other major UK policy priorities and in particular the role of oil which had been seen as a "balancing fuel". Any discussion on energy policy has been linked to oil supply and pricing and not concern for the environment. He suggested that an energy policy should take into account factors such as:

provision of low-cost supply; security; price stability between fuels; employment, safety and welfare; control over investment etc. And he commented on the central role that environmental considerations are likely to play in shaping future energy policy — which has not been the case so far.

In the discussion which followed, many speakers returned to the role that a coordinated energy policy could play in energy conservation. Energy efficiency should not solely be thought of as the responsibility of politicians and the energy industry; local authorities should review their policies; architectural design too has a crucial impact on energy efficiency, as does energy education.

In concluding the session on energy and the environment, Lord Nathan, the Society's President, in supporting the need for an energy policy, stressed that the enormity of the task should not be underestimated: the life of policies was often limited to the timespan between two elections — a period far too short for energy policy.

Landfill gas — an energy source

The subject of renewable energy sources was returned to later in the conference with a paper from Dr Keith Richards (Energy Technology Support Unit Harwell Laboratories) looking at the potential for landfill gas; it was he said not only rich in methane, but plentiful, relatively cheap to exploit, to a large extent benign and a 'green energy'. The fact that even small landfill sites can be developed economically, and a suggestion that planning authorities should require a gas utilisation scheme for new landfill sites was warmly welcomed. Energy from this source was more likely to be used by large industrial consumers rather than domestic consumers.

Manmade mineral fibres

The fact that even energy efficiency programmes can have associated health risks was illustrated by a paper given by Professor Charles Rossiter of the London School of Hygiene and Tropical Medicine. The risks associated with asbestos which has been widely used as an insulation material are well known; concern is now beginning to focus on the link between manmade mineral fibres and lung diseases. Essentially, the links are tenuous, and may relate only to workers in the early MMMF industry when production techniques differed from modern practice. As with many investigations where epidemiological data is scattered and confused, there is a need for further research into MMMFs, and for a precautionary approach in the meantime. As Prof. Rossiter pointed out, twenty or thirty years is too long to wait for the outcome of long term studies. In response to questions from EHOs already concerned about asbestos, Prof. Rossiter identified the use of lightweight fibres in confined spaces (loft insulation, for instance), insulation removal and very fine ceramic fibre sources as being of particular concern. Local authorities should certainly review their policies on all fibres, he said.

Noise

Neighbour and transportation noise are generating an increasing number of complaints. Dr. Les Fothergill of BRE outlined new developments in methods of insulating walls, floors and ceilings to deal with noise in buildings; Jeff Charles (Bickerdike Allen Partners) in illustrating the role that acoustic designers could play in eliminating noise, stressed the need for them to be involved at the earliest possible stage in a development; more awareness of the benefits of acoustic

design in the training of architects would also be a sensible idea. Given the rather gloomy prognosis that noise from various sources (home, transport, industry and the workplace) would not get substantially better, Jeff Charles suggested that it was time that a review of the 1963 Wilson Report on Noise was made. At its recent meeting, NSCA's Noise Committee decided that a review should be carried out and that the Royal Commission on Environmental Pollution would be the obvious body to undertake the work.

Quieter roads

Noisy motor cycles may soon become past history if results from the static noise test developed by NSCA noise expert, David Romaine (Derby CC) and the Noise Committee continue to live up to expectations. The test which can distinguish between a 'noisy' motor cycle and one silenced to acceptable standards is to be piloted by Derbyshire Constabulary, having been given approval by the Police Legal Department and the Crown Prosecution Service.

The advantages of electric vehicles in not only reducing noise pollution but also pollution from exhaust emissions was described in detail by Alan Aldous (Electric Vehicle Development Group). However policy and decision matters at both local and national level were being slow in realising the potential of this technology, which is being keenly developed in the USA, Japan and Germany.

Vehicle emissions

Ian Berwick (UK Petroleum Industry Association) discussed the impact of oil prices on air quality, changes in the petroleum products market between 1983-87, and how developments have affected emissions of pollutants. In

1973, he said, annual lead emissions were 8,400 tonnes and this figure had now fallen to 3000 tonnes. However, he said, taking lead out of petrol had been done primarily to pave the way for the universal application of catalytic converters, thus eliminating other vehicle emissions; and he felt that any further reduction in lead emissions would depend on making autocatalysts mandatory.

Rob Searles (Johnson Matthey, Catalytic Systems Division) agreed; while autocatalyst technology is now well developed with 200 million being sold around the world, in the UK there has been very little take-up. There would need to be more government support if people were to be encouraged to buy 'clean cars' (a car with an autocatalyst costs roughly £250 more) in preference to other extras such as power steering, stereo etc.

In answer to a question from the floor Rob Searles assured delegates that catalytic converters should last the life of an average car (in the US they must still meet standards regulations at 50,000 miles), and also that they can be recycled, being 100 times richer in platinum metals than those dug from the ground. Cars fitted with autocatalysts can only run on unleaded petrol.

1992

The impact of the Single European Act 1986 will mean the European Commission having significant influence on *inter alia* environmental and pollution policy throughout Member States of the EEC; the concern now must be to ensure implementation in practice of the many Directives and regulations throughout Member States. Lawyer Richard Macrory (Centre for Environmental Technology, Imperial College) discussed the implications for the UK of harmonisation of

standards throughout EEC Member States and the likely agenda for future EEC air pollution policies.

On the part of local authorities there was some concern about the lack of any direct involvement in drafting legislation, which in the end would be their responsibility in many cases to implement; furthermore insufficient resources or manpower could make implementation as the EEC recognised it difficult to carry out.

Pollution control

Local authority representatives were also concerned about their future role in relation to HMIP. From the questions put to HMIP Director, Brian Ponsford, it was clear delegates were not convinced that the Inspectorate could be effective at present levels of staffing and resources; in particular the arrangements for inspection of Scheduled Processes came under criticism: there was also a feeling that HMIP were overly obsessed with the interests of industry at the expense of improving and enforcing pollution control measures. The long-promised revised legislation on air pollution was even more urgent.

To this latter question Brian Ponsford replied that we would "have to see", however he said that HMIP did take local authority involvement very seriously and hoped to strengthen this through recruitment, although there had been problems in recruiting an EHO to the new Local Authority Unit.

Assessing risk

The UK Government's recent promotion of nuclear power generation as offering the way forward in controlling air pollution ensured a large audience for the final session of the conference: 'Civil Nuclear Power — how safe is safe

enough?' John Rimington, Director of the Health and Safety Executive, explained the HSE's approach to assessing risk, with particular reference to nuclear power.

Professor Roger Kasperson of the US Hazard Assessment Group pointed to the importance of understanding and taking note of the public's perception and views of nuclear power; generally people don't like new risks, but will tolerate a risk so long as there are tangible benefits for them. For nuclear power to go forward with public confidence, he suggested the following critical factors: demonstrated record of safety performance; because the catastrophic element is a very strong force in public concern, appropriate means to limit the risk should be developed (eg safer nuclear power stations); there must be a clear separation (clarity) between military and peaceful uses; the problem of radioactive waste must be solved in such a way as to raise the level of public confidence in the ability to dispose of it safely.

From the discussion which followed it was clear that the apparent secrecy surrounding the development of nuclear power and the operation of nuclear power stations was a major factor against gaining the public's confidence in energy generation from this source; lack of knowledge and confusing information were also seen as major reasons hindering public acceptance.

Perhaps, suggested one speaker, the only way to get a full debate and elucidation of all the facts and economics surrounding nuclear power would be through the development of a coordinated energy policy taking account of all sources of energy — their costs and environmental impact — the theme which had linked much of the conference.

Looking to the future

In closing the conference, Chairman Bill Snow, in drawing attention to the diversity of subjects tackled by delegates said that this was clear evidence of the Society's need to widen its interests — water quality, waste disposal management, continuing work on air and noise pollution and on nuclear safety — all had an impact on air pollution control. The continuing theme throughout the conference of the need for a UK energy policy was an area the Society would be following up at forthcoming council and committee meetings.

Publicity

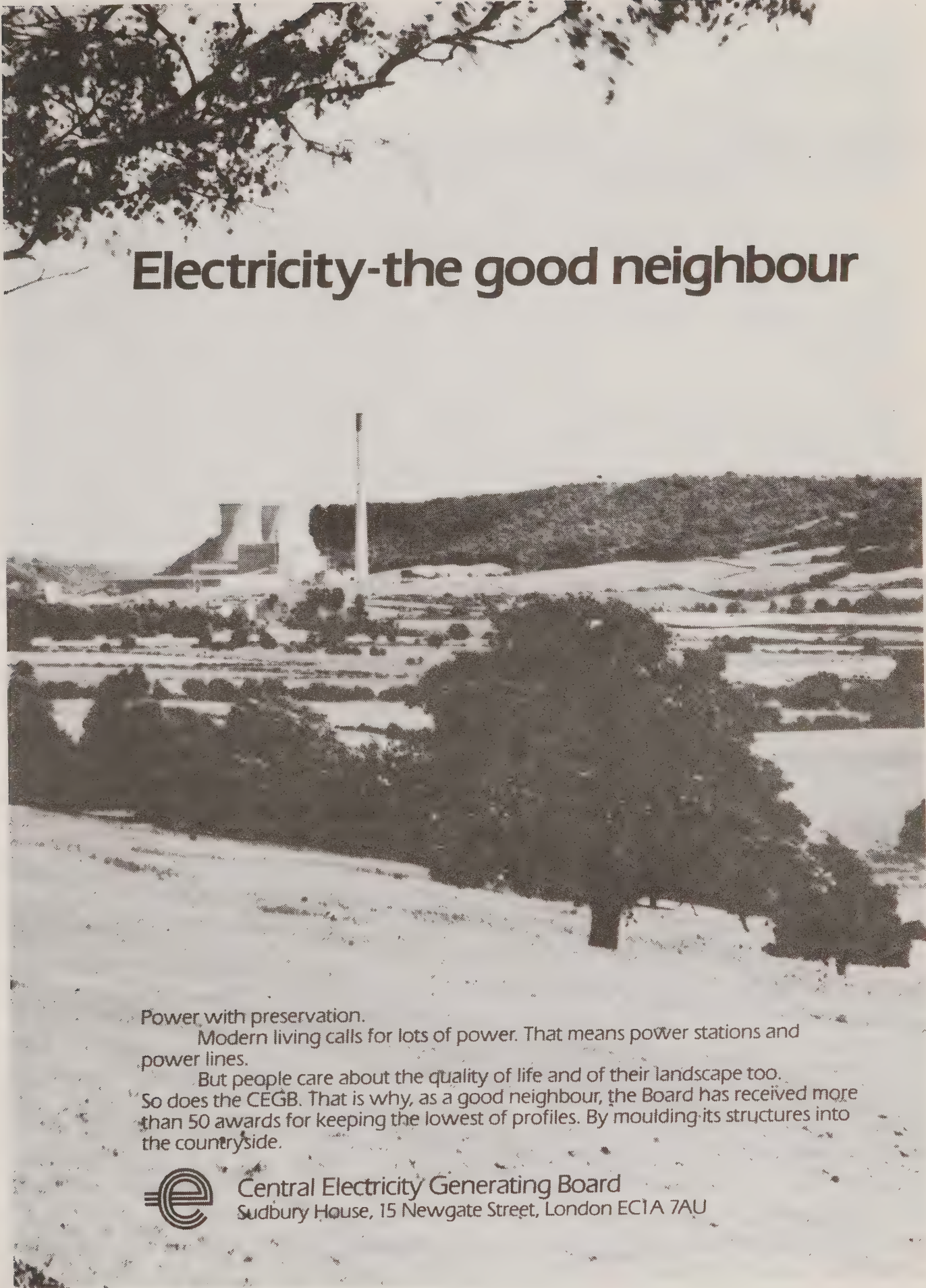
NSCA Secretary-General, John Langston, was interviewed on BBC Radio 4 'Today' programme about the NSCA's objectives and on the conference programme. Granada TV sent a team to the conference to interview David Romaine about his roadside test for measuring motorcycle noise and to see the test in action, and there was also some national press and professional journal coverage.

RNLI

A collection organised by Cllr Harrison of Wakefield following the successful rescue by the local RNLI of a family of seven whose yacht foundered, raised £75 for the RNLI.

Conference proceedings

All the papers presented at the conference together with the keynote speech will be published in early 1989.



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REPORTS

POLLUTION PROBLEMS FROM THE DISCHARGE OF PROCESS EMISSIONS TO THE ATMOSPHERE DURING INTEGRATED CIRCUIT MANUFACTURE

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1. INTRODUCTION

It is quite common for pollutants generated during industrial processes to be discharged to the atmosphere in a haphazard way. As a result, pollution problems frequently occur. Even when discharges are small, they are capable of causing local pollution problems within the plant site.

Pollution problems specifically related to integrated circuit manufacture are concerned mainly with the discharge of acid fume and organic solvents from etching and cleaning processes and of small quantities of relatively dangerous materials, such as arsine and phosphine, used for semiconductor doping. The emissions are mostly relatively small and will thus cause mainly local pollution problems, within the immediate vicinity of the source rather than at any great distance. There are some similarities with the problems of discharges from chemical fume cupboards. These have been a subject of interest for some time and there is now a fair amount of literature on the subject. (Ref 17 considers some aspects of it.)

There are two main ways of controlling ambient pollutant concentrations. The discharge can be limited by controlling the process or by abating it. Alternatively the point of

discharge can be arranged so that any pollutants are adequately dispersed, and thus diluted, in the atmosphere before reaching any point of concern. It is also, of course, possible to use a combination of these two approaches. In fact, very few process control and abatement methods are perfect and normally require the effective dispersion of some residual emission. The choice of pollution control methods may depend on reasons other than cost effectiveness or convenience. For example, it may be felt that the discharge of particular pollutants is undesirable or there may be specific regulations limiting their emission rates.

If there is no specific requirement to limit the discharge *per se*, it is normally required that some predetermined concentration of a pollutant should not be exceeded in places where some problem may be so caused. This may be related to possible health effects either for the employees within the plant site or for the general populace beyond it, nuisance due to odours and other causes, or possible damage to plants or buildings. The present discussion is limited to health effects and nuisance.

The paper discusses the various facets of the pollution control problem as outlined above. These are the control and abatement of pollutant discharges, their dispersion in the atmosphere and the significance of the resultant ambient concentrations. The roles of the various regulatory authorities are also considered. For reasons of explanatory convenience these are dealt with in reverse order. The main consideration is given to normal process emissions, but some attention is also given to large short duration releases that might result from an accidental failure of plant or control equipment.

2. REGULATIONS AND REGULATORY AUTHORITIES

Control of ambient pollutants rests with a number of different authorities and is covered by a number of different regulations depending upon the nature of the workplace and the group of individuals affected.

For workers within the workplace, the Health and Safety Executive is responsible, via the Factory Inspectorate, for controlling working conditions as covered by the Factories Acts and the Health and Safety at Work Act, including exposure to ambient pollutants. Though the normal concern is directly with the work area, the exposure of workers within the factory site to pollutants discharged out into the atmosphere via the normal ventilation system is also covered.

Some works involving the use of specific chemicals or processes are scheduled under the Alkali Acts and come under the control of Her Majesty's Inspectorate of Pollution (HMIP). These include most of the major chemical processes and a number of other specialised activities, large scale electrical power generation for example. The Inspectorate is responsible for ambient pollution problems both inside the works, that may affect workers, and outside the works, that may affect the general populace. It exercises some discretion over whether to schedule a works if its activities are of small scale. Thus some, but not all, integrated circuit manufacturing plants have been scheduled as arsenic works because of their use of arsenic compounds (principally arsine). The Inspectorate's approach is to employ the 'best practicable means' available at the time to control ambient pollutants. It issues guidance notes on the application of best practicable means to specific works and processes. The present approach is that it is necessary to control

and reduce emissions at source as much as possible and to place the minimum reliance upon atmospheric dispersion.

Pollution problems involving the general populace beyond the boundaries of the workplace are the responsibility of Local Authority Environmental Health Officers, except for those from scheduled works under the control of HMIP. In number terms they deal with the great majority of pollution problems. Their activities in the air pollution field are mainly covered by the Clean Air Acts and the Control of Pollution Act, though they also act on the grounds of 'nuisance' under the provisions of the Public Health Acts. It is also possible for individuals or groups of individuals to bring private actions through the courts. These are not uncommon, particularly where there are problems with odours or visible discharges, and are usually on the grounds of nuisance. They are often successful and have resulted in the closure of both processes and businesses.

It is worth noting that neither the Clean Air Acts nor the Alkali Acts specifically state what is required by way of pollution control methods or what pollutant limits are acceptable. The Clean Air Acts require that chimneys must be high enough to prevent emitted smoke, grit, dust or gases from being a nuisance or prejudicial to health. The Alkali Acts require that the 'best practicable means' be used to render emitted gases harmless and inoffensive where they have to be emitted. More recent legislation on air pollution originating via the EEC has tended to lay down specific limits for both emissions of pollutants and acceptable concentrations. HMIP also suggest guideline figures, particularly emission limits, for some pollutants in their notes on best practicable means.

Finally, there are two recent legislative innovations that are likely to affect future attitudes to ambient pollution problems. The first is the recent EC Directive on combatting air pollution from industrial plants (84/360/EEC). The ramifications of this are currently under consideration, but it seems likely that there will eventually be changes in the regulation of industrial discharges and a greater degree of public openness than previously. A review of the current situation can be found in the most recent report of HMIP(1). Secondly, there are the regulations on the Control of Substances Hazardous to Health (COSHH), which will become law during 1989. These will rationalise a number of existing regulations relating to hazardous substances, including air pollutants, and will place a number of specific duties upon employers using such materials. The HSE's code of practice (ref 2) contains a good review of the regulations and the background to them.

3. POLLUTANT EXPOSURE LIMITS

Ambient pollutant concentrations have to be compared against some acceptable limits beyond which they are expected to have some effect upon the environment. Limits may be set for reasons of health effects, nuisance (for example, odours or obscuration), plant or building damage or a variety of other reasons. The present paper is restricted to considerations of health effects and odour nuisance on a local scale, which will be the main areas of concern in integrated circuit manufacture.

For health effects on workers within the workplace, the Health and Safety Executive issues a list of Occupational Exposure Limits, or OELs (3), for both short and long term

exposure to a wide range of industrial chemicals. The Short Term Exposure Limit, or STEL, is for exposure times of less than 10 minutes duration and the long term exposure limit, Time Weighted Average or TWA, is for exposure over the working day. Some limits, described as Control Limits, are legally enforceable. The remainder are 'recommended' but nonetheless carry considerable weight. The 'workplace', in this context would include anywhere within the site boundary and would thus cover the exposure of workers to normally discharged pollutants.

For health effects on the general populace lying outside the workplace, the only pollutant exposure limits laid down are for smoke, sulphur dioxide, nitrogen oxides and lead. These are general limits for the EEC and are essentially concerned with long term, large scale pollution problems. They are thus of little significance to the present concern which is with local concentrations of process emissions. There is no equivalent to the list of Occupational Exposure Limits for exposure of the general populace to industrial chemicals. It is not acceptable to use the OEL values for the general populace as they are essentially intended for application to fit persons working an eight hour day. However, the general populace contains three groups of greater sensitivity to pollutants, the very old, the very young and the infirm. Lacking any more suitable alternative, it has become a common practice to take a small fraction of the OEL as a guide to acceptable pollutant concentrations for the general populace. Typically a figure of one fortieth of the OEL is used, though at Warren Spring Laboratory we have used one hundredth of the OEL for some particular materials.

Odour problems are a common cause of complaint, usually outside the workplace but occasionally within it. Sensitivity to odours varies enormously across the populace. It can also vary to a significant extent with individuals, depending upon the circumstances. For example, the nose can detect quite short duration exposure of the order of a second, but becomes fatigued and insensitive at long durations. Besides this natural variability, it is also a difficult matter to determine odour thresholds with any accuracy, so estimates from different sources can vary widely. There can also be a significant difference between the concentration at which an odour can be detected and at which it can be clearly recognised, typically this difference is a factor between two and five. (Ref 4 is a good bibliography of odour thresholds for a wide variety of materials and the Warren Spring Laboratory's guide to odour control (5) is a good introduction to the subject.)

In the event of a plant component failure or a major accident there may be very large discharges of pollutant to the atmosphere which will last for a relatively short time, perhaps only a few minutes or a few seconds, and which are unlikely to be repeated, possibly in an individual's lifetime. In such circumstances higher levels of pollutant exposure than the OEL (STEL) may be acceptable. The subject of tolerable doses from short period accidents is still one of much debate. Human toxicology data is almost always inadequate and plausible data is available for only a limited number of the more widely used chemicals. Thus no formal list of acceptable doses is issued in the UK and it is the practice to consider problems of this sort on an individual basis. In the USA, some guidance on high dose short term releases is provided by the National Institute for Occupational Health and Safety which quotes an exposure level 'immediately dangerous to life and health' (IDLH) (6). This is considered to be a guide to the exposure from which a fit person could escape within thirty minutes exposure without suffering any

escape impairment symptoms or permanent harm. No data is offered on the tolerance of the general populace to short term high doses. Table 1, below lists a few chemicals and the values of the various exposure levels considered above.

Table 1. Some Chemical Exposure Levels, mg/m³

	TWA	OEL STEL	IDLH	Odour Threshold
Hydrogen Chloride	7	7	150	15
Hydrogen Fluoride	2.5	5	16	.03
Nitric Acid	2	4	100	0.7
Trichlorethylene	535	802	1000	115
Toluene	375	560	7500	8
Ethyl Alcohol	1900	—	—	20
Arsine	0.2	—	24	3
Phosphine	0.4	1	270	.02
Silane	.7	1.5	—	—

A point of interest in the table is the relative values of the exposure levels between the three chemical groups. The organic solvents have relatively high exposure levels, the strong acids have low exposure levels and the diffusion process chemicals have very low exposure levels. The ratio of odour threshold to exposure levels is also of interest as odours can be instantly detected and it is useful to know the degree to which this may signify excessive concentrations.

4. DISPERSION

4.1 Principles

Pollutants discharged into the atmosphere are carried off and dispersed (diluted) by whatever wind is blowing. The dispersing forces are the natural turbulence in the wind, together with any other turbulence generated by the discharge itself or due to aerodynamic disturbances caused by the windflow around any nearby buildings or other topography. It is important to realise that because the dispersion is caused by turbulence it is a stochastic process, that is, it is unsteady, varying considerably from one moment to the next and having organised properties only over a sufficiently long averaging timescale, typically ten minutes or more in the case under consideration. Thus, even under nominally fixed dispersion conditions, the concentration of a pollutant at a particular point can show considerable short term variations. Near the source of pollutant, the variation in concentration can readily be from zero to an order of magnitude or more greater than the long term mean. The variation tends to reduce as distance from the pollutant source increases, becoming small at very large distances. The pollution problems under consideration here can be classed as 'near source' so that high levels of variability can be expected. This feature of dispersion is of particular importance in

odour problems since the nose can respond to exposure durations of only a few seconds or less and easily detects the peaks in the fluctuations.

It is useful at this point to introduce the relationship between discharge, dispersion and ambient pollutant concentration. This can be seen in the standard expression for contaminant concentration in a dispersing flowfield. If the wind blows from a fixed direction over a fixed site and a passive pollutant is released into the flow at some point, then the pollutant disperses over the site in a fixed pattern, irrespective of the windspeed or the amount of pollutant released. The concentration of the pollutant at a particular point on the site is given by:

$$\text{Concentration, } C = K \cdot \frac{Q}{UL^2} \text{ where}$$

- Q = the *rate* of emission of the pollutant (in g/s or whatever),
- U = the windspeed,
- L = the physical scale of the site, sometimes this is described by the height of a building or of a chimney, and
- K = a constant at the particular point on the site. The value of K depends upon the dispersion pattern around the site and has different values at different points.

Thus it can be seen that the pollutant concentration is directly proportional to the rate of emission of the pollutant, which might be expected. It is inversely proportional to the windspeed, thus the highest pollutant concentrations tend to occur at the lowest windspeeds. It is inversely proportional to the square of the physical scale. Thus, for example, in the case of dispersion around a building the pollutant concentrations are quadrupled if the building size is halved, or, as another example, in the case of dispersion from a chimney the pollutant concentrations are quadrupled if the chimney height is halved (this last case is only approximately true for various reasons). Finally, it depends directly upon the pattern of the dispersion around the site, this is a complicated matter and dispersion patterns can vary considerably depending upon the circumstances.

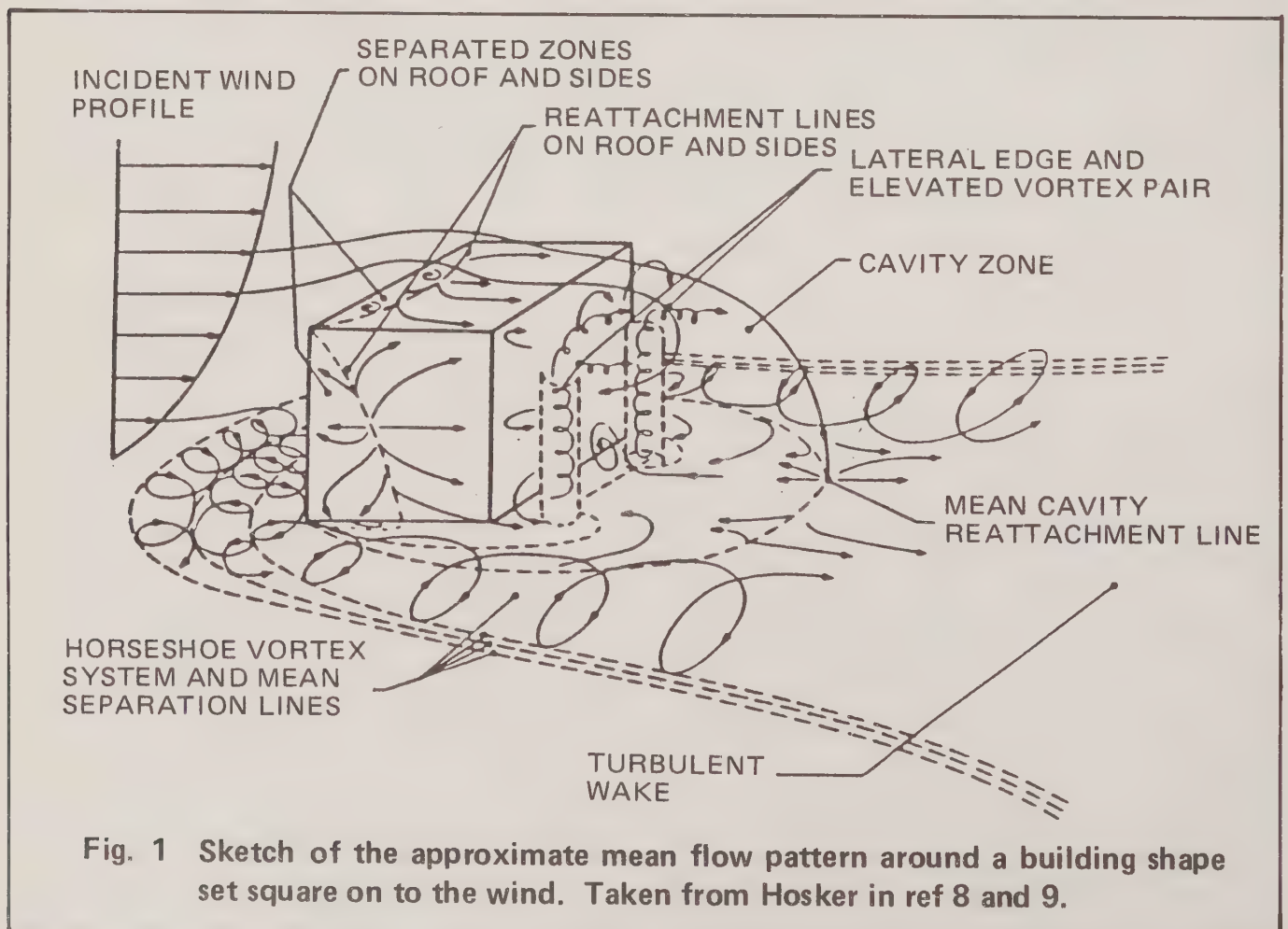
It is convenient to divide dispersion in the atmosphere into two broad classes. The first is dispersion from an isolated source, this is largely controlled by the characteristics of the wind. The second is dispersion from sources close to buildings or other topography where the dispersion is greatly affected, and may be completely dominated, by aerodynamic effects and additional turbulence from the buildings etc. In practice virtually all sources are associated with some sort of building structure. An old and fairly reliable rule of thumb for the division between the two cases is that if the discharge height is more than two and a half times the heights of the surrounding structures, then the dispersion is dominated by the wind. For lower discharge heights, building effects are significant. For discharges close to buildings, that is within one and a half building heights, building effects tend to dominate. This latter condition is the most frequently occurring in small process discharges of the sort that occur in integrated circuit manufacture.

The first class of dispersion, from isolated sources, is a well studied subject both theoretically and experimentally. Discharged pollutants stream away downwind in a long thin plume which has an included angle of the order of 10 degrees. If the discharge is buoyant or has any vertical momentum, then the plume will rise as it travels downwind.

The concentration of pollutant within the plume has a gaussian distribution and estimates of the standard deviation of the distribution for different distances from the source, weather conditions, etc., are published, so that the pollutant concentration within the plume or on the ground can be calculated easily. (There are a number of sources of plume spread data: ref 7 contains a good standard method for determining plume spread rates and the resultant pollutant concentrations; ref 8 contains a recent wide ranging review on the subject.)

The second class of dispersion, that affected by the presence of buildings and topography, is of the greatest interest here. If the discharge is at a height of greater than about one and a half building heights, then the plume will probably pass clear of the building itself, but its path will be diverted downwards, resulting in a more rapid contact of the plume with the ground and consequently increased pollutant concentrations at the ground. If the discharge is at a height of less than one and a half building heights, then the discharge may be partly entrained in the flow around the building. Discharges at lower heights, below one and a quarter building heights, are likely to be totally entrained within the flow around the building and dispersed down to the ground around the building.

Flows around buildings are complex and so, as a result, are the associated pollutant dispersion patterns. Figure 1 taken from Hosker's paper in Ref 9 shows a diagrammatic representation of the flow around a simple rectangular structure set square on to the wind and clearly indicates this complexity. Dispersion patterns are also sensitive to the shape of the building, the orientation to the wind and the point of release of the pollutant. In



the right circumstances, quite small changes in any of these factors can greatly affect the resultant dispersion pattern. The position is further complicated by additional effects due to the presence of other nearby buildings or topography, as is often the case. (Further information on this subject can be found in Hosker's review on dispersion around buildings in ref 8 and also in a more recent review by the same author on flow and dispersion near clusters of buildings, ref 9. There has also been a recent review on the subject by Foster and Robins, ref 10.)

Thus, it is not practicable to offer detailed guidance on dispersion around buildings except on a fairly individual basis. The best data is obtained from small scale model testing in wind tunnels. Here, dispersion patterns can be measured directly using trace gases in lieu of the pollutants of interest and it is possible to investigate a wide variety of possible scenarios quickly and easily. However, this is a fairly expensive process and is not always appropriate, particularly in the first instance or when dealing with small scale problems. It is possible, though, to offer broad guidelines which can be used to judge the order of ambient concentrations that might be expected from a pollutant discharge. Some of these are outlined in the next section, together with some comments on good practice.

4.2 Practice, some dispersion formulae and notes on good practice

In the case of a pollutant discharge near a building that may contaminate a nearby ventilation air inlet or opening window which is in line-of-sight from the discharge, the highest concentration of the pollutant that is likely to occur, is given by Reid et al in a paper presented at the NSCA conference in 1963 (Ref 11),

$$C = 7. \frac{Q}{UL^2},$$

C = pollutant concentration at distance L,

Q = emission rate of the pollutant,

U = local windspeed,

L = distance from the discharge to the point of concern.

This formula assumes that the discharge disperses uniformly in a cone-shaped plume straight towards the point of concern. In practice this will only happen occasionally, even when the wind is blowing in the relevant direction, as plumes close to buildings normally exhibit a high degree of meandering. The formula thus gives a likely upper bound to the pollutant concentration that might be expected. It should be noted that, at short distances, this formula may also predict a pollutant concentration higher than that actually discharged from the source, since it presumes a point source. Wilson (Ref 12) has proposed a modified form of the equation which corrects for this effect,

$$C = (1 + 0.33/(Q/UL^2)^{1/2})^{-2}$$

The two formulae give the same value of C at long distances, except that the factor of 7 in the simpler equation has the equivalent value of 9 in Wilson's equation. The difference is irrelevant to the order of accuracy of this sort of calculation.

If a pollutant discharged from the roof or other part of a building is completely entrained in the flow around the building, then a rough guide to the order of the average pollutant concentrations on the roof of the building and on the ground area downwind in constant

wind conditions is given by a form of the standard expression for the concentration of a contaminant in a dispersing flowfield described earlier,

$$C = K \cdot \frac{Q}{UA}$$

The terms have the same meaning as before except that the L^2 term is replaced by A , the crosswind cross sectional area of the building for building widths up to about four building heights. For buildings wider than this, the width should be taken as five building heights. Appropriate values for K are:

- 10 for the area on the roof around the pollutant source,
- 1 for the area on the downwind side of the building immediately around the building, and
- 0.1 for the area on the downwind side of the building about 5-10 building heights downwind.

These values are meant to be order of magnitude rather than precise estimates. For calculating pollutant dispersion at greater distances, the National Radiological Protection Board (13) have proposed a simple technique for correcting for the effect of a building on the initial dispersion.

It is a good practice, where possible, to ensure that any pollutant discharge beyond the trivially small clears its immediate surroundings, particularly the building from which it is discharged. For many small process discharges this is often sufficient to avoid pollution problems, which are only likely to be local in extent. A rough rule of thumb for achieving this, mentioned above, is that the discharge should be at a minimum height of 25% of the maximum building height above the building. (A method for making a more sophisticated assessment of the conditions required, and for estimating pollutant concentrations on buildings caused by discharges from low stacks, can be found in Wilson's paper, Ref 12. Much of Wilson's work on low level discharges has also been incorporated into the sections on stack design of the ASHRAE Handbook Ref 14).

It is useful to be able to make a quick estimate of the discharge stack height required for effective dispersion of a pollutant emission, particularly where the effects of buildings on stacks of moderate height need to be accounted for. There is no specific guidance laid down in the UK for the determination of stack heights for effective dispersion of the general range of pollutant discharges. There is, however, a guidance note for the determination of stack heights for combustion plant running on gas and oil fuels, the most commonly occurring need. This is the Memorandum on Chimney Heights (Ref 18) issued as an addendum to the Clean Air Acts. Though not intended for the purpose, it can be used to determine approximate stack heights for other emissions and includes a quick method for correcting stack heights for the effects of buildings. In order to do this it is necessary to convert the pollutant discharge of interest into an equivalent polluting discharge of sulphur dioxide. This can be done quite simply by scaling the discharge of interest by its relative molecular weight to that of sulphur dioxide (64) and then scaling again by the ratios of the acceptable maximum ground level concentration required for the pollutant of interest to that for sulphur dioxide used in the Memorandum ($430\mu\text{g}/\text{m}^3$). The main source of error in this approach is in any differences in discharge momentum and buoyancy that may exist between the discharge of interest and that of the equivalent conventional combustion plant that has been assumed. Stack heights

calculated using the Memorandum incorporate an assumed additional effective height due to plume rise which may be different to that of the discharge of interest. Some estimate of this error can be made by calculating the plume rise using the method outlined below.

Stack discharge conditions are an important factor in achieving effective dispersion close to the source and also in making the best use of stack height and plume rise. Discharges should be vertically upwards, and unimpeded by chinese hats or other covers or cowls. This allows the maximum rise of the discharge plume. Discharge velocities should also be sufficient to ensure that the discharge plume clears the stack and is not entrained down it. The nominal discharge velocity required to achieve this is a value in excess of the local windspeed; in practice a good minimum design figure is around 10ms^{-1} . Higher discharge velocities do produce a greater plume rise, but the gain is relatively small even for quite large increases in velocity. The rise of a discharged plume can be calculated using Briggs' plume rise formulae (Ref 13), which are,

$$\text{rise due to momentum, } h_m = 2.3.U^{-2/3} X^{1/3} (r.(wd/2)^2)^{1/3}$$

$$\text{rise due to buoyancy, } h_b = 1.6.U^{-1} X^{2/3} (g(1-r). wd^2/4)^{1/3}$$

$$\text{total rise } h_t = (h_m^3 + h_b^3)^{1/3}$$

where, U = local windspeed,
 X = distance from stack,
 r = (density of discharge)/(density of air),
 w = discharge velocity,
 and d = stack exit diameter.

It can be seen from the 'combined rise' formula that the plume rise at a given distance is normally dominated by whichever of rise due to momentum or due to buoyancy is the greatest. Rise due to momentum dominates close to the discharge point and rise due to buoyancy at greater distances.

The writer is frequently asked about the use of dilution of the pollutant before discharge as a means of reducing ambient concentrations. It can be seen from the standard expression for a dispersing contaminant in a flowfield, introduced in section 4.1, that pollutant concentration is directly proportional to the rate of pollutant discharge, irrespective of source concentration. Dilution does not reduce the rate of discharge and does not, therefore, reduce ambient concentrations. In fact, dilution does reduce ambient concentrations very close to the source, typically within a few metres, but this is usually of little value and the effect is completely lost at greater distances since dilution due to dispersion in the atmosphere is so great. For example, even in a light wind of 2ms^{-1} , the concentration within a discharged pollutant plume is diluted down to about one thirtieth of the source value at a distance of 10m from the source.

The discussion about dispersion has so far presumed that some sort of steady wind is blowing. There are, however, occasions when no wind blows at all and some consideration must be given to these conditions. Meteorologically 'calm' conditions (when anemometers cease to rotate) occur for about 4–5% of the time in the most sheltered, inland, parts of the UK. During these periods there is usually some residual, slow air movement, genuinely still air conditions are relatively rare and do not normally persist for very long periods, perhaps a few hours at a time. In these low or zero wind

conditions, dispersion tends to be dominated by the nature of the discharge rather than by the wind. Thus, for example, a discharge of buoyant material with a good vertical discharge velocity is likely to rise well away from its source. However a discharge of heavier-than-air material, or a discharge with low vertical momentum, may disperse little and persist around its discharge point. Very light winds can also be of variable direction, both over time and at different heights. This can result in discharged material drifting away and then returning. It is thus possible under some conditions for discharged pollutants to simply accumulate around the discharge area. The only ready solution to such problems is to stop the discharge.

5. PROCESS CONTROL AND ABATEMENT

Since the ambient concentration of a discharged pollutant is directly proportional to the rate of discharge of the pollutant, any reduction of the rate of discharge is a major pollution control measure. There are two ways of achieving this. Either the process itself can be modified to reduce the production of any pollutant, or pollutant can be removed, abated, by treatment of the gas stream. As was remarked in the previous section, dilution of the gas stream in order to reduce the concentration of the pollutant before discharge serves no direct purpose as it does not affect the ambient concentrations of the dispersing pollutant. There are, however, emission limits for gas stream concentrations laid down by HMIP for some scheduled processes. These are essentially based on the best standards currently readily achievable and are intended as a means of control of the quality of abatement systems. (A list of these limits can be found in Ref 1.)

A detailed discussion of pollution control by process modification is beyond the scope of this paper as it requires a thorough knowledge of the processes themselves as well as pollution problems relating to them. It can be remarked, however, that sometimes small changes in processes can markedly reduce pollutant discharges. Fumes from cleaning and etching baths, in particular, can often be considerably reduced by some attention to detail in the process. Maintaining the lowest practicable operating temperatures, keeping exposed areas of the bath surface to a minimum and controlling and reducing air currents which cause excessive evaporation can all be very effective.

There is a wide variety of commercially available abatement systems and it is only practicable to discuss the subject briefly here. Some general observations can be made. Firstly, no single abatement system will be effective for all pollutants. Secondly, very few abatement systems are perfectly efficient, there is almost invariably some residual pollutant which must be discharged to the atmosphere and dispersed. Thirdly, the higher the concentration of the pollutant in the gas stream, the easier it is to deal with it efficiently and cost effectively. In cases where there are only small concentrations in large volume gas streams, a common situation with ventilation air, abatement may be impracticable. Finally, abatement systems are known to malfunction occasionally and it is useful to consider whether the consequences of such a failure, even if rare, may be unacceptable. There are four main abatement techniques, scrubbing, incineration, absorption and filtration (filtration here includes electrostatic precipitation). They are discussed briefly below. (A more thorough review of abatement techniques can be found in Ref 15 and a directory of manufacturers of abatement equipment can be found in Ref 16.)

Scrubbing is effective for the removal of soluble gases, such as acid vapours, and entirely ineffective for insoluble materials, such as most organic solvents. The use of reactive scrubbing solutions, such as caustic solution for treating acid vapours, improves the efficiency of removal. It is desirable to aim for high removal efficiency, otherwise the residual discharge of pollutant in combination with large quantities of water vapour can sometimes be more offensive than the original pollutant alone. This is particularly the case with acid vapours which, in addition, tend to produce persistent visible plumes. It should also be remembered that scrubber discharges are normally quite cool so that there is little buoyancy to generate plume rise and so assist dispersion of the residual pollutant. High efficiency scrubbers tend to have significant operating costs due to the high powered pumps required.

Incineration can be an effective method of abating oxidisable pollutants, particularly odorous materials. Combustion chamber temperatures in excess of 800 degrees centigrade and residence times of 0.5–1 second are the minimum requirement. These conditions can be reduced if catalytic oxidation is used but there are increased capital costs and catalysts are poisoned by some materials. If the pollutant will not self-combust then operating costs can be high if there is no heat recovery or if the gas volume is large. Abatement by incineration does not improve all pollutant emissions. Pure hydrocarbons are normally removed effectively. However, other compounds may produce worse pollutants than the original. For example, the combustion of carbon disulphide to produce sulphur dioxide, the combustion of some chlorine containing compounds to produce hydrogen chloride, or the combustion of compounds or mixtures of compounds containing both chlorine and carbon ring molecules which may produce dioxins. Partial incineration, usually as a result of too low combustion temperatures or too short residence times, should be avoided. Partial combustion products are often more offensive than the original pollutant.

Absorption, normally using active carbon filters, can effectively remove organic and some other vapours. The method can be effective at relatively low pollutant concentrations and is also good for removing many odorous pollutants. The filters eventually reach an absorption equilibrium with the gas stream, so that vapours absorbed in a gas stream of high concentration may desorb again if the vapour concentration reduces. In principle this property could be used as a means of reducing large short term peaks in vapour concentration, though the author is not aware of an operating example of the technique. When saturated, filters must either be replaced or the pollutant desorbed at high temperature (usually as part of a recovery cycle). Apart from operating cost, the two main operating difficulties with carbon filters are the high gas stream pressure drop and the ease with which the filters can be blocked by water or oil droplets or by particulate. (Both incineration and absorption techniques are discussed more fully in Ref 5.)

Filtration of discharged pollutants seems to be of little interest in semiconductor manufacture since virtually all discharged pollutants are vapours. One possible application is in the control of discharges of arsine, phosphine, silane and similar highly toxic materials used in relatively small quantities during manufacture. These vapours are not removable by scrubbing or absorption or much improved by incineration. However, the incineration products are particulates and can then be removed by filtering. This has been done in one or two instances. A combined incineration and filtering process is relatively costly, but the relatively small gas volumes often involved would make this a manageable option.

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EFFICIENCY OF ELECTRICITY USE

Introduction

The House of Lords, Sub-Committee B European Communities Committee is examining a proposal from the European Commission on a Community Action Programme for improving the efficiency of electricity use. The objective of the Programme is both to influence consumer behaviour in favour of the efficient use of electricity and to improve the efficiency of electrical equipment. We give here a summary of the Commission's proposals, followed by the NSCA's written evidence to the Sub-Committee. This evidence is based on comments from NSCA's Technical Committee.

Reasons for promoting the more efficient use of electricity

1. The Commission says that electricity consumption, which grew at about 3 per cent a year during the 1980s now accounts for about 17 per cent of final energy demand in the Community. Electricity is the vector through which solid fuels and nuclear power have greatly reduced the Community's dependence on imported oil, and will in future be the main vector through which renewable energies can contribute to Community energy supply.
2. Savings in electricity correspond to still greater savings in primary energy demand. In 1987, electricity consumption of 1570 TWH required the input of 367 MTOE of primary energy. A 5 per cent reduction in electricity use in 1987 would have reduced the requirement for primary fuels for electricity consumption by 18.4 MTOE.
3. If 90 per cent of equipment and appliances used in the Community had been the most efficient commercially available, this would have resulted in an 11 per cent drop in electricity consumption in the industrial sector, 20 per cent drop in the residential sector, and 11 per cent and three per cent less consumption in the tertiary and transport sectors respectively.
4. Reductions in electricity consumption due to increased efficiency, in avoiding the need for additional generating plant would imply consequential reductions in costs to electricity consumers, and thus a considerable reduction in atmospheric pollution.

Community action programme

It is proposed to involve electricity distributors, consumer organisations, professional institutions and manufacturers of electrical appliances and equipment in the programme, as well as the Governments of Member States. All have been consulted in the drawing up of the Action Programme which will include better consumer information and technical advice on the purchase, installation and most efficient use of appliances and equipment. The Commission wants action not only to improve the efficiency of appliances and equipment but also to increase the market share of the most efficient models already commercially available. The Commission while not favouring the "massive use" of financial incentives nevertheless feels that there may be situations where these would be advantageous.

NSCA EVIDENCE

A programme for the conservation of electricity is particularly welcome from the air pollution perspective. The thermodynamics of electricity generation ensure that every unit of electricity saved results in a saving of around three units of primary heat energy — from either fossil fuel combustion or nuclear fission. Both technologies can have a potentially serious impact on the environment, and the proportionally large savings which can be made in primary energy use by electricity conservation offer an attractive method of reducing pollution.

The logic of this argument, however, can be seen in a different way. Electricity generation by fossil or nuclear fuel cannot deliver more than 40% of the energy content of the fuel, and many power stations have efficiencies in the low 30s percentage range. Thus while electricity is a useful, high-grade energy source for specific applications, its use as a source of low-grade space heating is inherently inefficient. No attempt is made by the Commission Document to disaggregate future demand projections, but if the British pattern is repeated across Europe, a significant proportion of demand arises in the space heating and low-temperature water heating sector. Substitution of electricity for other energy sources in this sector should be neither assumed nor encouraged.

Another problem identified by the Commission centres on the need for financial incentives. Often the high capital cost of energy efficiency measures — be it insulation installation, or the cost of a more efficient appliance — discourages individuals or institutions whose resources are limited, or who expect a very short payback period. There is a mismatch between the huge capital investment programmes and long payback periods associated with electricity generation capacity, and the investment which individual consumers are prepared to make in energy conservation which, with a "least cost planning" approach, might offer a more effective national strategy.

Thus there are a number of prerequisites for the improvement of electricity efficiency in the Community which do not receive attention in the Proposal. These are:

- policies to discourage the inappropriate use of electricity, and to substitute with "clean" fossil fuel or renewable technologies where possible.
- effective thermal insulation programmes for buildings and water heating systems — including financial incentives which reflect the national savings achievable through reduced energy demand.
- less wasteful electricity generation methods, particularly the development of CHP and renewable sources.

Only then can full advantage be made of the laudable aims of this Proposal, which focus on consumer choice and appliance efficiency.

This Society applauds the proposal to establish national bodies responsible for the implementation and co-ordination of the proposed Community Action Programme. The environmental view should be adequately represented on such bodies. In the UK at least,

there are a number of obstacles to improving electricity efficiency, and several ways in which efficiency could be more effectively promoted. A full discussion of obstacles and options is outside the scope of this submission, but a Community Action Programme which promoted efficiency *throughout* the electricity sector — rather than just for particular end-uses — could play a significant role in reducing the environmental impact of energy use in the Community.

NSCA NEWS

Annual general meeting

The importance of taking account of international needs in any national approach to integrated pollution control was stressed by outgoing NSCA Chairman Ken Dunn at the AGM held in Llandudno on 24 October. Widespread concern of the likely effects of increased global warming — “the greenhouse effect” — acid rain, and depletion of the ozone layer were all problems which transcend national boundaries and require global solutions. And, he went on, that while there was still much to do in the area of smoke control, and in achieving our overall objective of clean air, other pollution issues such as noise and waste disposal were becoming increasingly important items on the Society’s agenda; nuclear power too was “uniquely worrying” to the public; an NSCA working party is considering whether the NSCA should adopt a new name to reflect its wider interests.

In commenting on the NSCA’s successful year, Ken Dunn paid special tribute to the Society’s President, Lord Nathan, and to all the members of Standing Com-

mittees and working groups. He said that particular thanks were due to the HQ staff in Brighton who for most of the last year had had to work in the most appalling conditions during major renovation work of the offices at 136 North Street.

Elections

Lord Nathan was unanimously re-elected President; Ken Collins MEP, Sir Hugh Rossi MP and Gareth Wardell MP were also unanimously re-elected Vice-Presidents, and Brian Edwick Hon. Treasurer.

Chairman 1988/89

At the Council Meeting following the AGM Mr. Bill Snow MIEH MIWH took over from Ken Dunn as Chairman of the Society. Bill Snow is one of the North West Division’s representatives in the NSCA Council. Mr. Alan Rees (Central Southern Division) joins Dr. Frank Shephard as a Deputy Chairman of the Council.

Hon. Member

In recognition of his long-standing service as Chief Environmental Health Officer of Derby County Council as well as seventeen years as Hon. Secretary for the East Midlands Division, members were pleased to give their unanimous approval to the nomination of Cllr. Eric Raven as an Hon. Member of the Society. Chairman Ken Dunn presented Cllr. Raven with a framed certificate commemorating the occasion.

Unleaded petrol — what's the problem?

Two million cars can run on unleaded petrol now. Another 7 Million could, with adjustment. Yet less than 2% of petrol sales are unleaded. What is preventing the British Public from going lead-free? To answer this question, NSCA commissioned a GALLUP poll of nearly 2,000 drivers to discover what the major barriers are. The resulting report* was released in November as a contribution to Lead-free Petrol Week, and received substantial media coverage.

The clear result of the survey is that lack of information is by far the biggest obstacle to uptake of unleaded petrol. Nearly a quarter of all respondents claimed that this was preventing them from converting. Many more were worried about unleaded availability, despite the fact that cars converted to unleaded can still use leaded petrol without risk. 4% of all drivers had a company car which had not been adjusted, showing that the fleet sector still has a major contribution to make. One encouraging point was that 8% of drivers said they were planning to have their cars converted: we must hope that such intentions are translated into action.

The data show some interesting variations in age, sex, social and geographic classifications. Women seem to be less aware of

most of the issues; young people and OAPs are least concerned about the importance of conversion and, perhaps understandably, most concerned about the costs. Not surprisingly, concern over costs is twice as important to people in social classes DE compared to the AB group. When it comes to price differentials, 12% of men said that unleaded petrol was not cheap enough to encourage them to change. Young people (16-24) are the least likely to be planning a conversion, and most likely to be short of information. There is least information about unleaded petrol in the North and Scotland, most in the South.

The NSCA report shows that some sectors of society are particularly poorly-informed. What is needed is a major information campaign, including TV advertising, that targets those who show most consumer resistance. Information is not enough; a further increase in the differential between leaded and unleaded — we recommend 10-12p — would encourage more people to take the plunge. NSCA will be following up various points arising from the survey with government ministers, retailers and trade associations.

* *"Unleaded Petrol — What's the Problem?"* available from NSCA, price £5.00 inc p+p.

Climate change

The first meeting of a new NSCA working group on climate change was held in London in December under the chairmanship of Dr. Ron Barnes (Esso Research Centre). The working group has been set up by NSCA's Technical Committee who felt that given the current public and political concern on the extent and possible consequences of the "greenhouse effect", there was an urgent need for

NSCA to finalise its own policy on this issue. NSCA's policy statement will be used to respond to general enquiries, and to provide the basis for NSCA's input into parliamentary and other bodies seeking evidence.

Global warming is to be the topic for our next teaching pack for schools; the pack will be available in time for the 1989/90 school year and is to be aimed at secondary school children.

Noisy neighbours

Barking dogs, amplified music, general domestic noise, voices and DIY activities are the five major sources of complaints about noise from neighbours. The NSCA Noise Committee recently set up a working group to look at the problem and how local authorities deal with it. As a first step a short survey is to be carried out to determine current practice in dealing with specific neighbour noise problems, with a view to compiling guidance notes on the methods which have been found most appropriate for handling specific nuisances.

Clay pigeon shooting

Under the new General Development Order, the number of days on which clay pigeon shoots can take place on a piece of land, before planning permission is required from the local authority, is to be reduced from 28 to 14 days.

Recent research undertaken by NSCA on noise in the countryside shows clay pigeon shooting to be a major source of complaints, with by far the majority relating to shoots which escape local authority control through the existing 28-day loophole. The NSCA supports the Government's action in tightening controls — after all, if the shooting clubs are concerned to be good neighbours,

they should happily apply for planning permission and co-operate with local authorities in minimising the nuisance caused by their activities.

The Clay Pigeon Shooting Association is fiercely opposing the reduction and NSCA will be resisting any attempts by them to get the Order reversed. Hopefully, too, the Department of the Environment's Code of Practice on Clay Pigeon Shooting, long awaited by this Society, will also reflect the very real annoyance felt by many people who are affected by uncontrolled shoots.

Pollution Handbook and Glossary, 1989

These two publications are the former *NSCA Reference Book* and *Environmental Glossary*. For the 1989 edition, the *Pollution Handbook* has been updated to take account of new and proposed legislation in the areas of air, noise, water and soil pollution and waste disposal. The *Pollution Glossary* has been revised and restructured and a number of new definitions added to relate it far more closely to the *Pollution Handbook*. *The Handbook costs £13.95 and the Glossary £6.25, both inclusive of p. and p.*

NSCA Handbook 1988/89

This will be circulated to all Members and their appointed representatives during February. It contains full information about NSCA Officers, the Divisions, Committee membership, and a Directory of UK organisations with an interest in one aspect or another of the environment. The section on smoke control areas has been updated and is also available separately. *Price of Handbook to non-members and of additional copies to members is £7.60. Smoke Control Areas update, only, £5.00, both inclusive of p. and p.*

Northern Division

The Northern Division's AGM held in Newcastle-upon-Tyne on 29 July was attended by 63 people. Councillor Len Poole, immediate past-president of the NSCA, was re-elected Chairman of the Division. In his report to the Division he stressed the importance of making sure people realised that just because smoke control programmes were largely completed, this did not mean that the battle against air pollution had been won; the Division's practice of visiting new venues and drawing on the expertise of a wide-range of speakers would ensure the Division's future. The meeting was then addressed by Ken Dunn (former Chairman of the Society) and Air Commodore Langston, Secretary General. Following lunch provided by courtesy of the Solid Fuel Advisory Service, Mr. Graeme Robson, Regional Manager gave a presentation.

He said he recognised that the coal industry prior to 1952 bore a great responsibility for atmospheric pollution, most certainly in the domestic situation. However, the industry had now advanced through research into one of the foremost in protecting the environment: for instance, smokeless fuels and appliances with a capacity to use such fuels had been developed. A video was shown which illustrated the development work and achievements of the industry and the SFAS. In conclusion Mr. Robson acknowledged the point that many people make in that they tend to use other than solid fuel because of the benefits that the other fuels offer; however he had no doubt he and his colleagues could demonstrate the effectiveness of solid fuel showing that it was not in any way inferior to other fuels.

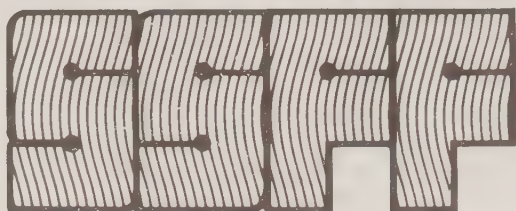
East Midlands Division

Fifty-eight members attended the East Midlands Division Autumn meeting which was held in Newark, Notts and followed by a talk and visit to British Sugar PLC's factory. Mr. A.W. Mason, Factory Manager, summarised the history of the sugar industry and the manufacturing process. He said that from a daily intake of 7,000 tonnes of sugarbeet, 800 tonnes of granulated sugar, 600 tonnes of juice, 600 tonnes of animal feed and 200 tonnes of molasses are obtained. Mr. Richard Leeky who deals with environmental aspects of the Company's process said that public awareness of emissions had been heightened considerably since the 1960s. The main sources of emission at the factory were the boiler chimney, the animal feed drying plant, the lime works and the effluent storage.

The boiler plant had been on a reduced demand since energy saving measures had been introduced and in terms of the EEC Directive for large boiler plants the capacity would fall just below the 50 MW figure.

The animal feed drying plant did not at present give rise to a high level of complaint but that could change if dwellings were built in closer proximity to the works. A pilot plant had been installed, which incorporated condensation, chlorine scrubbing, bio-scrubbing, electrostatic precipitation and catalytic incineration. The target had been a 95% reduction in odour, but no combination had produced better than 88%; drying techniques were now being altered to see what effect that would have. The wide variety of questions from members demonstrated their close interest in the points made by the speakers.

SOLID SMOKELESS

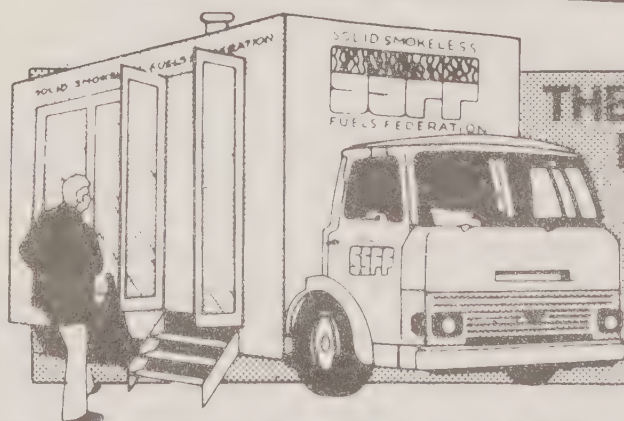


FUELS FEDERATION

The Solid Smokeless Fuels Federation is an independent advisory organisation promoting the interests of the Producers and Distributors of domestic Solid Smokeless Fuels.

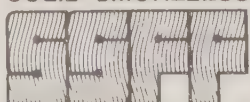
The Federation's primary aim is to encourage and develop the use of Solid Smokeless Fuels for domestic heating.

Since the introduction of the 1956 Clean Air Act the Federation's work has been closely linked with Local Authorities encouraging the use of Authorised Solid Smokeless Fuels on approved appliances.



**THE FEDERATIONS STAFF AND
EXHIBITION EQUIPMENT
ARE AVAILABLE TO
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8th World clean air congress and exhibition

The preliminary programme and registration form has now been published for the World Clean Air Congress to be held 11 – 15 September 1989 in The Hague, Netherlands. The central theme of the Congress is 'Man and his Ecosystem'. Among the areas to be discussed in both lecture and poster sessions are: air quality in public buildings, the home and the car; emissions, air pollution control; air pollution meteorology; policy towards clean air; acidification; and an integrated approach to control. A number of technical excursions and day tours have also been arranged. The Congress is being organised by the Dutch Clean Air Society, CLAN, who expect up to 2000 participants. The Registration fee (if received before 1 June 1989) is Dfl 850 (approx £230) and for accompanying persons Dfl 235 (approx £62).

A programme and registration form has been enclosed with this issue of Clean Air. Further copies are available from NSCA's office in Brighton.

Clean Air around the world

"The Law and Practice of Air Pollution Control in 14 Countries in 5 Continents" – this is the title of a new book published by the International Union of Air Pollution Prevention Associations (IUAPPA). Drawing from expertise around the world, the book surveys air pollution control in countries as diverse as Australia, West Germany and Korea, as well as the UK.

Each country is described in terms of the development of its air pollution control, clean air philosophy, regulations in various sectors, and methods of implementation and enforcement. The book is

organised systematically to allow for easy comparison between countries.

In his foreword, IUAPPA President Dr Louis Clarenburg says that its prime purpose is to provide a source of advice to assist developing countries to avoid the air pollution problems encountered in the industrialised nations. However, it is also hoped that many professionals throughout the world will find it a handy reference to the law and practice of clean air around the world.

UPDATE

Air pollution control consultation

The long-awaited consultation paper on air pollution control in Great Britain was finally published in mid-December. This follows on from the December 1986 consultation which proposed in particular extending the application of best practicable means by giving local authorities powers of authorisation over a second tier of potentially polluting processes.

This new consultation paper sets out the Government's detailed proposals for the works that should be scheduled for control by HMIP and those for control by local authorities. It also details proposed changes to the list of noxious or offensive substances currently contained in schedule 2 of the Health and Safety at Work (Emissions into the Atmosphere) Regulations 1983.

Not such a fair city

Smog readings of 800 microgrammes per cubic metre are not unusual in Dublin (the EEC 'safe' limit is 250 microgrammes); on one night in late November

the smog level reached a massive 1,350 microgrammes per cubic metre in a Dublin suburb. Smog masks have returned to the streets and warnings broadcast whenever levels of smog are such as to cause problems for people with respiratory ailments.

However, the Irish Government is at long last beginning to take action to deal with the problem: Dublin's first smokeless zone covering 800 houses in the Ballyfermot area was finally announced in mid-November; it took six months to set up and is to be implemented over six months which means no immediate improvement in smog levels. A spokesman for the Green Alliance has pointed out that at this rate of progress, it could take 125 years before Dublin's 200,000 houses become smoke-free!

Pollution — who cares?

The video, narrated by David Bellamy, takes us through a day in the life of a typical family, at work, at home and at leisure; it shows how without really fully realising it, we contribute to pollution and waste the earth's resources. The video opens with a radio report of an environmental problem caused by human activities, and closes leaving us with the clear impression that despite the media attention, the family are totally unaware that they too are responsible for what happens to the environment.

A very clearly presented non-technical video which should be given a wide audience. It follows an earlier British Gas video which concentrated on mainstream air pollution problems. Available on free loan or for purchase, £14.95, on VHS or Beta; also available on 16 mm film.

Contact British Gas Film Video Library, Parn Hall Road Trading Estate, London SE21.

HMIP Chief

Mr. Michael Tunnicliffe has been temporarily promoted to Chief Inspector of Air, Water and Waste at HMIP following the resignation of Mr. Rod Perriman. Mr. Tunnicliffe, who will take up the appointment early in January joined the Civil Service in 1963 as an Alkali Inspector and became Deputy Chief Alkali Inspector in 1971, and is currently Deputy Chief Inspector (Air) in HMIP.

CoEnCo — new name

CoEnCo has changed its name to the Environment Council — which as new Chief Executive, Steve Robinson rightly says will make its areas of interest clearer to those coming across the organisation for the first time. A new programme — the business and environment programme — is to be launched early in 1989 to meet the growing need for environmental expertise within business. Encouraging the use of cleaner technologies and training for managers on how the environment affects their work are two of the services to be developed.

Coordinating environmental policy

Two members of the Royal Commission on Environmental Pollution, Lord Cranbrook and Dr Charles Suckling have proposed the setting up of an independent environment protection commission. In a presentation at the end of October to the All Party Parliamentary Conservation Committee, they argued that some kind of agency was needed to take an overview of UK environmental policy and to develop an integrated strategy towards it. In their presentation they also suggested that such a commission could carry out research and monitoring, promote environmental awareness, advise the Secretary of State on potential problems and the need for new regulations and

liaise with other government departments and local authorities.

The NSCA will be following the fortunes of this proposal with interest: in our response to the Department of Environment's consultation paper on integrated pollution control, we put forward the idea of just such an agency with specific responsibilities for environmental protection to ensure a coordinated and disinterested development of environmental policy in all sectors.

Extra funds for environmental research

An extra £2.6 million is to be allocated to the Department of Environment's 1989/90 environmental research programme, bringing the total to £35.8 m.

The environmental research programme covers radioactive wastes, air pollution, land wastes, toxic substances, countryside, water, planning, natural resources and local government. The additional provision for 1989/90 includes £1.23 million in support of trials of water metering, as well as provisions for research into the North Sea marine environment, waste disposal and climatic change.

COSHH regulations

The new regulations for the control of hazardous substances and for protecting people exposed to them at work come into force on 1 October 1989. The regulations cover all substances hazardous to health (except asbestos, lead, materials producing ionising radiations and substances below ground in mines, which are covered under other legislation).

The regulations will affect all workplaces where substances which could harm workers' health are used. To help employers prepare for the regulations,

the Health and Safety Executive has issued a number of explanatory leaflets; *Introducing COSHH* is a brief guide to the new requirements for controlling hazardous substances in the workplace; *Introducing Assessment* is a guide for employers on what is entailed in carrying out assessments; the third leaflet is called *Hazard and Risk Explained*. The leaflets are available free from HSE Area Offices.

COSHH database

Occupational Hygiene Engineering Associates Limited (O'heal) have launched a computer database to help UK business comply with the new COSHH regulations. Under the Regulations employers must make Assessments of tasks that may have an adverse effect on the health of employees; Assessment records must be kept for 30 years. The database which can be adapted for a user's specific needs allows input and retrieval of data on a single criterion or on a complex combination of criteria.

Ozone protection

The Montreal Protocol on Substances that Deplete the Ozone Layer came into effect on 1 January 1989 following ratification by 24 countries including the UK. The Protocol provides for the production and consumption of CFCs 11, 12, 113, 114 and 115 to be reduced by 50% by 1999. However most scientists and politicians are now agreed that this measure is not sufficient and that an 85% reduction is needed simply to stabilise the amount of chlorine in the atmosphere to prevent further depletion.

The UK Government will be hosting a major international conference in March in London to underline the importance of protecting the ozone layer and to show how the objective of further reducing CFC emissions can be achieved.

CFC recovery project

The Technical University of Twente, Netherlands, is starting an experiment to reclaim CFCs from old refrigerators and freezers. The Dutch Ministry of the Environment has made funds available for this experiment. The aim is to investigate whether a country-wide system can be set up to reclaim CFCs. The experiment will take approximately three months. After removing the CFCs, the oil in the cooling system will also be removed and the refrigerators themselves broken up. In Gottingen (Federal Republic of Germany) old refrigerators are collected and the CFCs removed and made available to manufacturers who can re-use them. The oil in the cooling system is also removed before the refrigerators are sent to the scrap yard. In Sweden, there is talk of requiring manufacturers of fridges and freezers to take back the old ones.

CFC substitute

Both ICI and Du Pont have announced plans to build production plants for HFC 134a, an 'ozone benign' substitute for CFC 12 (used in refrigerators and air conditioning equipment). While it is planned that full production of HFC 134a should start during 1991, a number of technical problems still need to be resolved; ICI also say that adequate toxicological data is still needed.

Britain's trees deteriorate

A recently published survey from the Forestry Commission has revealed an eight per cent deterioration in the health of Britain's trees since 1987, measured by the standard of crown density. A quarter of British trees had more than 26% loss of foliage compared with a notional "perfect" tree. The number of Scots pines showing ill-health has risen from 10% in 1985, to 60% in 1987 and nearly

80% in 1988. The crown density of beech had however improved, and Norway spruce and oak remained the same. The survey was carried out by Dr John Innes of the Forestry Commission, who blamed a combination of climate, air pollution, insect attack and fungi for the decline.

Acid from the sky

This 44 minute video produced by the CEEGB explores the issue of air pollution and the damage to lakes and forests which has been attributed to acid rain. There are interviews with air pollution experts and the film takes a look at some of the research projects investigating the problem and searching for solutions. The film also considers the technological programme being implemented by the CEEGB in response to the problem of acid rain. The film is available on 'free loan' or for sale on 16 mm film, and on VHS, Beta and U-matic video.

Contact the CEEGB Film and Video Library, Park Hall Road Trading Estate, London SE21 8EL.

Air Pollution, Acid Rain and the Environment

The forthcoming privatisation of the Electricity Supply Industry, the cost of fitting flue gas desulphurisation systems to power stations to reduce sulphur dioxide emissions, and the impact of both these on environmental standards are the subject of much debate at the moment. A report from the Watt Committee on Energy's Working Group on Acid Rain updates their 1984 report on acid rain which looked at the fate of airborne pollution, vegetation and soils, freshwater and remedial strategy, and includes two new subsections — buildings and non-living materials.

This later report accepts that there is now sufficient evidence that sulphur dioxide emissions in particular are an important cause of acidification and of the elimination of fish and organisms from many lakes and rivers. It does not accept, though that the case for attributing the ill-health of trees either in this country or in Europe, to air pollution or 'acid rain' has been proven, but agrees that there is a need for continued monitoring to look for air pollution damage. Similarly, they conclude that more research is needed to establish whether oxides of nitrogen cause the same amount of damage to buildings as sulphur dioxide.

The report's editor in his introduction to the report says 'I think that it is probable that many of the forecasts of doom and destruction being made by some 'environmentalists' will prove as inaccurate as those made on other environmental topics 15 or 20 years ago''. Let's hope he's right!

Edited by Kenneth Mellanby. Published on behalf of the Watt Committee on Energy by Elsevier Applied Science Publishers. 1988. Price: £40. ISBN 1-85166-222-7

The heat trap

A recent report* from Friends of the Earth has recommended that reducing carbon dioxide levels is the most important element in slowing down and reversing current global warming trends. FOE is calling for the wealthy industrialised nations to reduce CO₂ emissions by 20% of 1988 levels by 2005, and 50% by 2015. A nuclear power programme, however, is not the way to achieve this say FOE, not least because of the high costs involved and the environmental problems of disposal of nuclear wastes and hazards of radioactivity.

Instead governments should put far more priority into implementing energy efficiency and conservation programmes. In the USA, the report says, improving electrical efficiency has been shown to be nearly seven times more cost effective than nuclear power for abating CO₂ emissions. Other policy priorities include elimination of CFCs by 1995, home insulation programmes, and development of fuel efficient and less polluting motor vehicles.

* *The 115 page report 'The heat trap' which looks at the rise in greenhouse gases, temperature levels and ecological impacts, was commissioned by FOE from the Climatic Research Unit at the University of East Anglia. It is available from FOE, 26-28 Underwood Street, London N1 7JQ. Price £10.*

Greenhouse studies

The House of Lords Select Committee on Science and Technology has set up a sub-committee "to consider the scientific grounds on which policy relating to the greenhouse effect should be based, and what action by the United Kingdom is required". The sub-committee is to be chaired by Lord Carver.

The House of Commons Energy Committee is to examine the Government's energy policy in the light of rising concern from both scientists and politicians about emissions of carbon dioxide and other trace gases and their contribution to global warming.

LSS appointment

Robert V Wharton, Deputy Chairman and Chief Executive of High-Point Plc, has become Chairman of London Scientific Services.

Mr. Wharton is Chairman of Rendel, Palmer & Tritton, which recently acquired LSS from the London Residuary Body.

Man made mineral fibres

The British Occupational Hygiene Society (BOHS), a body concerned with the effects of work upon health, has endorsed the view of the DHSS Committee on Carcinogenicity with regards to workplace exposure to Man Made Mineral Fibre (MMMF). A spokesman for the BOHS said that while most of the available evidence suggested that when properly handled, the risks to health from MMMF were very small, there is still insufficient evidence to prove that they are totally without risk to health, and that some types of MMMF had been shown to have the ability to cause cancer, either in man or animals. The BOHS also points out that the International Agency for Research on Cancer has recently allocated the category 2B (Possibly carcinogenic to Humans) to glass wool, rock wool and ceramic fibres.

Public awareness about the health effects of asbestos dust has resulted in a switch towards MMMF, and there is some concern that MMMF may, like asbestos, pose a threat to health.

Since their introduction about 90 years ago, it has been recognised that MMMFs can irritate the skin and eyes, and very dusty conditions may also irritate the nose and throat.

The ability of the many types of MMMF to induce cancer is still being investigated, although some very large studies have been completed. One conclusion that has been reached, however, is that the early days of rock wool production caused a threefold increase in the risk of developing malignant tumours among workers; modern processing techniques have considerably reduced the concentration of fibres in the workplace, by comparison with the conditions that prevailed over 30 years ago.

Asbestos wastes code of practice

The Institute of Wastes Management has published a code of practice for the safe handling and containment of asbestos wastes. Among the code's recommendations are secure enclosure of all asbestos waste, immediate covering in special areas of landfill sites and monitoring of the atmosphere for fibres. The code was prepared with the help of the HSE and HMIP and other interested parties, including local authorities were also involved in the drafting. The IWM hope that waste disposal authorities will make adherence to the code part of site licensing conditions. (*Copies of the code available from IWM, Tel 0604.20426: £5.50*).

EUROPE

New emission limits

From 1993 all vehicles sold in the EEC with engines of less than 1.4 litres must meet new exhaust emissions limits. However, despite lobbying by environmental groups, and against the wishes of The Netherlands, Denmark and Greece, emission standards have been set at a significantly lower level than current US and Japanese standards. Emission limits have been set at 8g per test for hydrocarbons and nitrogen oxides and 30g for carbon monoxide.

EEC environment ministers have come out against allowing any Member State to introduce tax incentive schemes which might encourage consumers to buy less polluting cars. The Dutch Government, however plans to introduce such a scheme in January 1989, despite threats from the European Commission to test its legality in the European Court.

Air quality directive reform

The European Commission has published proposals for a Directive amending the 1980 Directive on air quality limit values and guide values for sulphur dioxide and suspended particulates. Initially the Commission proposes revising Annex IV which sets limit values for suspended particulates as measured by the gravimetric method (used by West Germany, Italy and Denmark) and to amend articles 10(3) and 10(4) accordingly. More far-reaching changes which will also affect the UK have been delayed until the end of 1992.

Titanium dioxide directive

The EEC Council of Environment Ministers has finally agreed the directive on waste from the titanium dioxide industry. Titanium dioxide is used as a white pigment and as a filler for plastics and rubber, etc. The directive which was proposed in 1983, bans dumping of all wastes from TiO_2 manufacture by the end of 1989. Discharge standards have also been set for other parts components of the industry's liquid effluent streams, including weak acids and various salts and sludges.

Aircraft noise

The European Commission has put forward proposals for limiting the noise level of jets taking off and landing at European airports. If agreed by Member States, as from 1 November 1990, EC airlines will not be allowed to lease or buy second-hand aircraft from outside the EEC which do not meet the most up-to-date noise standards. The new standards will cover Group Two category aircraft (ie certificate of airworthiness between 1969 and October 1977, including several types of DC-9, Boeing 727, 737 and 747).

Environmental barriers

An important decision of the European Court of Justice could have far-reaching implications for environmental protection. The Court has decided that Denmark can continue to bar imports of non-returnable bottles and charge a deposit on returnable ones in efforts to protect its environment; this decision over-ruled an earlier one that the interests of free trade must come before environmental protection. The decision has been welcomed by environmental groups who were concerned that the harmonisation of standards and dismantling of trade barriers in 1992 could lead to lower standards of environmental protection.

Pollution in Poland

A third of Poland's population are living in an "ecological disaster area" according to a report published by the Academy of Sciences in Warsaw in early December. Sulphur dioxide emissions are the second highest in Europe, water is mostly undrinkable and beaches too polluted for bathing. The amount of waste polluting the country has been put at 50% higher than five years ago. The report claims that economic losses attributable to environmental pollution are as high as 10% of gross national product.

Freeze on NOx emissions

An International Protocol aimed at freezing the emission of nitrogen oxides at present levels by 1994 was signed by Britain and most other leading industrialised nations in early November. Several countries, including The Netherlands, France, West Germany and Italy signed a further document agreeing to reduce emissions by 30% by 1998.

BOOK REVIEWS

During 1988, we received a great number of interesting books and reports for review. We regret that, mainly due to staff shortages, we have been unable to comment on them all in detail. We hope, however, that the brief summaries which follow will be enough to give a sufficient idea of the content of each.

Air Pollution and Acid Rain The Biological Impact

Alan Welburn. Publishers: Longman. 1988. ISBN 0-582-01464-6. Price: £17.95.

Concentrating on how different organisms are affected by airborne pollution, the book follows atmospheric pollutants from their sources, through their entry into living organisms and examines in detail the reactions within plant and animal cells, and their response to them.

Environmental Engineering 2nd edition

P. Aarne. J. Jeffrey Pierce. Ruth Werner. Publishers: Butterworths. 1988. ISBN 0-409-90040-8. Price: £39.95.

Intended for junior or senior level engineering students the text is organised into five areas important to environmental engineers — covering water resources, air quality, solid and hazardous wastes, noise and social and ethical considerations.

Earthing Electricity — The Environment and Electricity Privatisation

David R. Cope and Peter Thames. Publisher: UK CEED. 1988. ISBN 0-948729-104. Price: £30.00.

An extended discussion paper on the environmental issues and implications of the privatisation of an industry which, the authors state, is exceptionally vulnerable to environmental pressures.

Electricity for Life? Choices for the Environment

Jim Skea. Publishers: CPRE/FOE. 1988.

A report outlining the development options available for the electricity supply industry. Three scenarios for the future are set out and their economic and environmental implications are assessed. With impending privatisation of the industry, essential reading for anyone concerned with the environment and the electricity supply.

Regional and Long-range Transport of Air Pollution

Ed. S. Sandroni. Publishers: Elsevier (for the Commission of the European Communities). 1987. ISBN 0-444-42818-6.

Lectures given at a course held at the Joint Research Centre, Ispra, Italy in 1986. The course which brought together 19 European and US experts aimed to provide an overview of the knowledge in the different fields involved in the atmospheric transport of trace constituents. The lectures illustrated the need for a multi-disciplinary approach in understanding and dealing with long-range air pollution problems.

Acid Rain and the Environment 1984 – 88: A select bibliography

Compiled and edited by Lesley Grayson. Publishers: The British Library and Technical Communications. 1988. Price: £29.

Updates and complements a previous volume of the same name covering 1980 – 84. This useful bibliography covers publications and reports worldwide. References have been restricted to those which should be fairly easily obtainable through national documentation centres or academic and specialist libraries. References have been classified into: the issues; the scientific controversy; research; effects; and mitigation strategies.

Buildings and Health: Information Pack

Published by Information and Library Service of Institution of Mechanical Engineers. 1988. Price: £18.50. ISBN 0 85298 678 5

Information for the manager, engineer, or student requiring an introduction to the problems of buildings and health. Two main sections deal with (a) buildings and health information and (b) Buildings and health references.

Advances in Air Sampling

by American Conference of Governmental Industrial Hygienists. Publishers: Lewis Publishers Inc. (UK distributors John Wiley and Sons Limited). 1988. Price £39.45. ISBN 0-87371-115-7

New techniques in air sampling for the workplace and community atmospheres are reviewed. Also discusses gases, vapours and threshold limit values for particulates based on size-selective sampling. The book follows an ACGIH symposium held in 1987 which brought together the industrial hygiene community and people concerned with non-occupational air exposures. Case studies were presented for beryllium, wood dust, and sulphuric acid aerosols.

Catalysis Today Vol 2 No 4 – Catalytic Reduction of Nitrogen Oxides – A review on the Fundamentals and Technology

Publishers: Elsevier Science Publishers. Price: US\$83.80

A survey of recent developments in the nitrogen oxide removal process which will also serve as an introductory guide to the field of nitrogen oxide technology. *Catalysis Today* is a serial publication dealing with topical themes in catalysis and related subjects. Subscription rates on request. 'Sampler' issues available on request, from the publishers (PO Box 211, 1000 AE Amsterdam).

Directory of Environmental Abbreviations

Publishers: The Environment Council (formerly CoEnCo), 80 York Way, London N1 9AG. 1988. Price: £3.95 inc p. & p.

WWOOF, WAGBI and SLOAP, as well as the perhaps more recognisable NSCA, PCBs and BPEO are all included in this new Directory of nearly 1000 abbreviations and acronyms. As well as definitions, a brief description of each is also included.

Acid Rain and the Environment 1984-88 A Select Bibliography

Ed. Lesley Grayson Publishers: Technical Communications. 1988. ISBN 0-7123-07575. Price: £29.00.

Complementary to a previous volume 'Acid Rain and the Environment 1980 — 1984'; the references have been essentially restricted to easily accessible documentation, divided into five sections and with index of authors and of organisations and projects.

Information Pack on Buildings and Health 1988

Publishers: Institution of Mechanical Engineers. 1988. ISBN 0-85298-5. Price: £18.50.

Information for the manager, engineer or student requiring an introduction to the problems of buildings and health. In two main sections 'Buildings and Health Information' lists information sources and 'Building and Health References' contains abstracts and details of recently published material.

Climate Shocks: Natural and Anthropogenic

K. Ya Konratger. Publisher: John Wiley and Sons. 1988. ISBN 0-471-83019-4. Price: £47.50.

A broad based investigation by a leading Soviet atmospheric scientist of the possible impact on the climate of multiple nuclear explosions. The author proposes several provocative and controversial ideas, drawing from a wide variety of sources of information to tackle the subject of climate change.

Magnox — The Reckoning

Philip Davies. Publishers: Friends of the Earth. 1988. ISBN 905666 635.

A report on Britain's first generation of nuclear power stations, embracing the economics, safety, politics and legacy of Magnox.

Pesticide Users' Health and Safety Handbook: an international guide.

Andrew Watterson. Publishers: Gower Technical. 1988. ISBN 0 566 02781 X. Price: £30.

With 504 pages, this book may seem rather weighty to be called a 'Handbook'; it does however contain some useful information about precautions to take when using pesticides, and data sheets on over 200 pesticides, although some of the latter may be out of date already. For instance the data sheets on aldrin/dieldrin do not mention that it is to be phased out of use and banned by the end of 1992. This book as its title suggests is aimed at users of pesticides — farm workers, local authority parks and garden staff, as well as environmental health officers involved with monitoring.

FUTURE EVENTS

22–23 FEBRUARY – Conference: Radioactive waste management

Organisers: As above

Venue: Gloucester London Hotel, London SW7

Details: As above

16–18 MARCH – Conference: Acid deposition in Gwynedd

Organisers: Snowdonia National Park

Venue: The Park's Residential Field Study Centre, Plas Tan y Bwlych, Maentwrog.

Details: Rodd Gritten, Snowdonia National Park Office, Tel: 0766 770274

10–14 APRIL – International trade fair and congress: technology for environmental protection

Organisers: Dusseldorf Trade Fair Company

Venue: Dusseldorf Exhibition Centre

Details: Dusseldorf Trade Fair Agency Ltd (UK representatives), Tel: 01-794 0166;

Fax: 01-435 9967

11–13 APRIL – Workshop: Taking industrial pollution control into the 1990s

Organisers: National Society for Clean Air

Venue: Lincoln College, Oxford

Details: NSCA, Tel: 0273 26313; Fax: 0273 735802

19–21 APRIL – Conference: Desulphurisation in coal combustion systems

Organisers: Institution of Chemical Engineers/ICHEME Coal Utilisation Subject Group

Venue: University of Sheffield

Details: IChemE, Tel: 0788 78214; Fax: 0788 60833

2 JULY – 22 SEPTEMBER – Training Course: Environmental impact assessment

Organisers: Centre for Environmental Management and Planning

Venue: University of Aberdeen

Details: CEMP, 48 College Bounds, Old Aberdeen AB9 1FX; Tel: 0224 272480;

Fax: 0224 487658.

9 – 22 JULY – International Seminar: Environmental impact assessment and management

Organisers: Centre for Environmental Management and Planning; with sponsors: World Health Organisation and United Nations Environment Programme.

Venue: University of Aberdeen

Details: CEMP, 48 College Bounds, Old Aberdeen AB9 1FX; Tel: 0224 272480; Fax: 0224 487658.

5–7 SEPTEMBER – 2nd International Conference: Acid Rain

Venue: Amsterdam

Details: Dr. Roy M. Harrison, Institute of Aerosol Science, University of Essex, Colchester CO4 3SQ

11–15 SEPTEMBER – 8th World Clean Air congress and exhibition

Organisers: Clean Air Society, Netherlands

Venue: The Hague

Details: CLAN, PO Box 186, 2600 AD Delft

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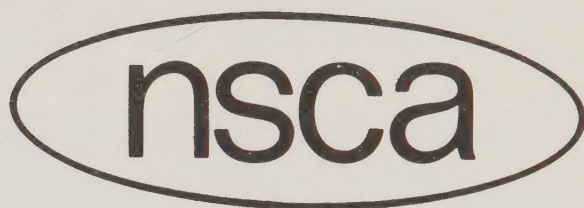
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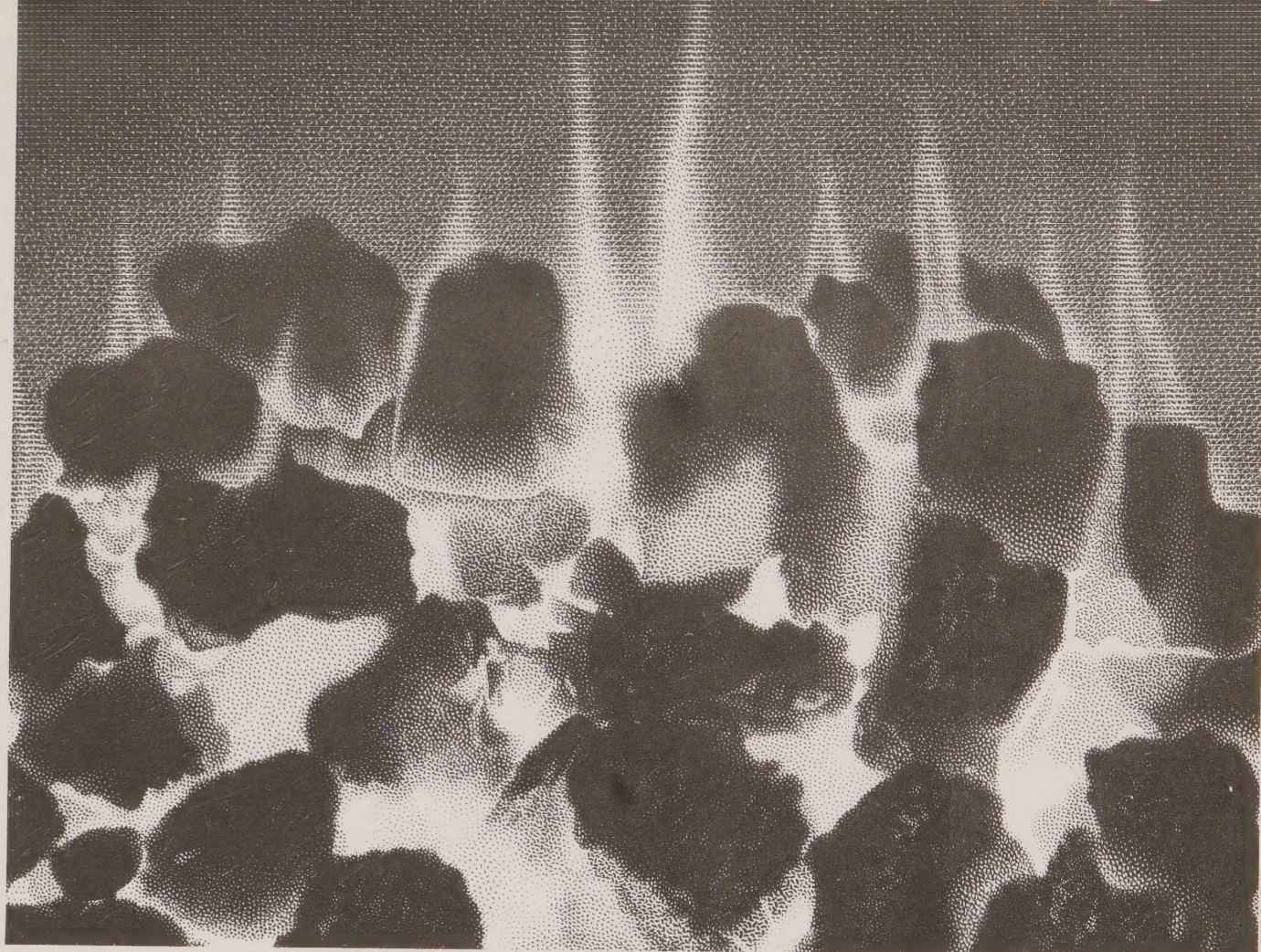
The Society invites the appointment of delegates to attend the residential Workshop to be held at Lincoln College, Oxford, Wednesday 12 and Thursday 13 April 1989.

Industrial pollution control is facing a period of considerable change. Forthcoming regulations and legislation from the UK and EEC will bring new requirements and place new demands on industry and control agencies alike. The need to integrate control is recognised – but how will this be achieved?

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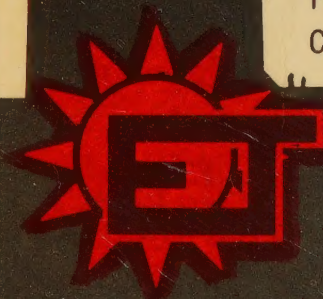
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